# Exhibit A

105921
AIR043 00092

STATE OF NEBRASKA

Pete Ricketts
*Governor*

DEPARTMENT OF ENVIRONMENTAL QUALITY
**Jim Macy**
*Director*
Suite 400, The Atrium
1200 'N' Street
P.O. Box 98922
Lincoln, Nebraska 68509-8922
Phone (402) 471-2186
FAX (402)471-2909
website: http://deq.ne.gov

# AIR QUALITY CONSTRUCTION PERMIT

**PERMIT NUMBER: CP15-008**

**Facility Name:** Big Ox Energy – Siouxland, LLC **NDEQ Facility ID#:** 105921

**Mailing Address:**
6601 County Road R
Denmark, Wisconsin 54208

**Facility Location:**
1616 D Avenue
Dakota City, Dakota County, Nebraska

**Project Description:** New biologically-based natural gas production facility

**Standard Industrial Classification (SIC) Code:** 2869, Industrial Organic Chemicals

**Revised or Superseded Construction Permits:** none

Pursuant to Chapter 14 of the Nebraska Air Quality Regulations, the public has been notified by prominent advertisement of this proposed construction of an air contaminant source and the thirty (30) day period allowed for comments has elapsed. This construction permit approves the proposed project as identified in the air quality construction permit application #15-008 received May 18, 2015, including any supporting information received prior to issuance of this permit. Additional details of the proposed project, including estimated pollutant emissions caused by the project, can be found in the accompanying Fact Sheet.

Compliance with this permit shall not be a defense to any enforcement action for violation of an ambient air quality standard. The permit holder, owner, and operator of the facility shall assure that the installation, operation, and maintenance of all equipment is in compliance with all of the conditions of this permit.

The undersigned issues this permit on behalf of the Director under the authority of Title 129 – Nebraska Air Quality Regulations as amended July 6, 2015.

4/15/16
Date

Shelley Schneider, Air Administrator
Air Quality Division

## TABLE OF CONTENTS

## ABBREVIATIONS, SYMBOLS, and UNITS OF MEASURE

| | |
|---|---|
| AP-42 | Compilation of Air Pollutant Emission Factors, Volume I, Stationary Point and Area Sources |
| BACT | Best Available Control Technology |
| bhp | Brake Horsepower |
| BMP | Best Management Practice |
| Btu | British Thermal Unit |
| bu | Bushel |
| CAA | Clean Air Act |
| CE | Control Equipment |
| CEM | Continuous Emissions Monitor |
| CEMS | Continuous Emissions Monitoring System |
| cf | Cubic feet |
| CFR | Code of Federal Regulations |
| CO | Carbon Monoxide |
| $CO_2$ | Carbon Dioxide |
| $CO_2e$ | $CO_2$ equivalent |
| CP | Construction Permit |
| DGS | Distiller's Grains with Solubles |
| DDGS | Dry Distillers Grains with Solubles |
| dscf | Dry Standard Cubic Feet |
| dscfm | Dry Standard Cubic Feet per Minute |
| EMIS | Emergency Management Information System |
| EPA | Environmental Protection Agency |
| EQC | Environmental Quality Council |
| EP | Emission Point |
| ESP | Electrostatic Precipitator |
| EU | Emission Unit |
| FID | Facility Identification Number |
| FDCP | Fugitive Dust Control Plan |
| FGR | Flue Gas Recirculation |
| FIP | Federal Implementation Plan |
| FR | Federal Register |
| ft | Feet |
| FTIR | Fourier Transform Infrared |
| GHGs | Greenhouse Gases |
| $H_2S$ | Hydrogen Sulfide |
| HAP | Hazardous Air Pollutant |
| hp | Horsepower |
| hr | Hour |
| lb | Pound |
| LDAR | Leak Detection and Repair |
| LNB | Low-$NO_x$ Burner |
| MACT | Maximum Achievable Control Technology |
| Mgal | One Thousand gallons |
| MMBtu | One Million British Thermal Units |
| MMscf | One Million Standard Cubic Feet |
| MSDS | Material Safety Data Sheet |
| MW | Megawatt |
| NAAQS | National Ambient Air Quality Standards |
| NDEQ | Nebraska Department of Environmental Quality |
| NESHAP | National Emission Standards for Hazardous Air Pollutants |
| $NO_2$ | Nitrogen Dioxide |
| $NO_x$ | Nitrogen Oxides |
| NSPS | New Source Performance Standard |
| NSR | New Source Review |
| PAL | Plant-wide Applicability Limit |
| Pb | Lead (chemical abbreviation) |
| PbR | Permit-by-Rule |
| PEMS | Parametric Emissions Monitoring System |
| PM | Particulate Matter |
| $PM_{10}$ | Particulate Matter with and aerodynamic diameter equal to or less than 10 microns |
| $PM_{2.5}$ | Particulate Matter with and aerodynamic diameter equal to or less than 2.5 microns |
| ppb | Parts per Billion |
| ppm | Parts per Million |
| ppmv | Parts per Million by volume |
| ppmvd | Parts per Million by volume, dry basis |
| PSD | Prevention of Significant Deterioration |
| PTE | Potential to Emit |
| RVP | Reid Vapor Pressure |
| RATA | Relative Accuracy Test Audit |
| RMP | Risk Management Plan |
| RTO | Regenerative Thermal Oxidizer |
| scf | Standard Cubic Feet |
| SIC | Standard Industrial Classification |
| SIP | State Implementation Plan |
| $SO_2$ | Sulfur Dioxide |
| $SO_x$ | Sulfur Oxides |
| TDS | Total Dissolved Solids |
| TO | Thermal Oxidizer |
| TO/HRSG | Thermal Oxidizer with Heat Recovery Steam Generator |
| tpy | Tons per year |
| TRS | Total Reduced Sulfur |
| TSP | Total Suspended Particulate Matter |
| ULNB | Ultra Low-$NO_x$ Burner |
| UST | Underground Storage Tank |
| UTM | Universal Transverse Mercator |
| VHAP | Volatile Hazardous Air Pollutant |
| VMT | Vehicle Miles Traveled |
| VOC | Volatile Organic Compound |
| WDGS | Wet Distiller's Grains with Solubles |

## I. GENERAL CONDITIONS

(A) This permit is not transferable to another source or location. {Chapter 17}

(B) Holding of this permit does not relieve the owner or operator of the source from the responsibility to comply with all applicable portions of the Nebraska Air Quality Regulations and any other requirements under local, State, or Federal law. Any permit noncompliance shall constitute a violation of the Nebraska Environmental Protection Act and the Federal Clean Air Act, and is grounds for enforcement action or permit revocation. {Chapter 41 and Chapter 17, Section 011}

(C) Application for review of plans or advice furnished by the Director will not relieve the owner or operator of legal compliance with any provision of these regulations, or prevent the Director from enforcing or implementing any provision of these regulations. {Chapter 37}

(D) Any owner or operator who failed to submit any relevant facts or who submitted incorrect information in a permit application shall, upon becoming aware of such failure or incorrect submittal, promptly submit such supplementary facts or corrected information. If the owner or operator wishes to make changes at the source that will result in change(s) to values, specifications, and/or locations of emission points that were indicated in the permit application (or other supplemental information provided by the owner or operator and reviewed by the NDEQ in issuance of this permit), the owner or operator must receive approval from the NDEQ before the change(s) can be made. In addition, any modification which may result in an adverse change to the air quality impacts predicted by atmospheric dispersion modeling (such as changes in stack parameters or increases in emission rates, potential emissions, or actual emissions) shall have prior approval from the NDEQ. The owner or operator shall provide all necessary information to verify that there are no substantive changes affecting the basis upon which this permit was issued. Information may include, but not be limited to, additional engineering, modeling and ambient air quality studies. {Chapter 17, Sections 006, 007, and 008}

(E) Approval to construct, reconstruct and/or modify the source will become invalid if a continuous program of construction is not commenced within 18 months after the date of issuance of the construction permit, if construction is discontinued for a period of 18 months or more, or if construction is not completed within a reasonable period of time. {Chapter 17, Section 012}

(F) The owner or operator shall allow the NDEQ, EPA or an authorized representative, upon presentation of credentials to: {Neb. Rev. Statute §81-1504}

(1) Enter upon the owner or operator's premises at reasonable times where a source subject to this permit is located, emissions-related activity is conducted or records are kept, for the purpose of ensuring compliance with the permit or applicable requirements;

(2) Have access to and copy, at reasonable times, any records, for the purpose of ensuring compliance with the permit or applicable requirements;

(3) Inspect at reasonable times any facilities, pollution control equipment, including monitoring and air pollution control equipment, practices, or operations, for the purpose of ensuring compliance with the permit or applicable requirements;

(4) Sample or monitor at reasonable times substances or parameters for the purpose of ensuring compliance with the permit or applicable requirements.

(G) When requested by the NDEQ, the owner or operator shall submit completed emission inventory forms for the preceding year to the NDEQ by March 31 of each year. {Chapter 6}

(H) Open fires are prohibited except as allowed by Chapter 30.

(I) Particulate Matter – General Requirements: {Chapter 32}

(1) The owner or operator shall not cause or permit the handling, transporting or storage of any material in a manner, which allows particulate matter to become airborne in such quantities and concentrations that it remains visible in the ambient air beyond the property line.

(2) The owner or operator shall not cause or permit the construction, use, repair or demolition of a building, its appurtenances, a road, a driveway, or an open area without applying all reasonable measures to prevent particulate matter from becoming airborne and remaining visible beyond the property line. Such measures include, but are not limited to, paving or frequent cleaning of roads, driveways and parking lots; application of dust-free surfaces; application of water; and planting and maintenance of vegetative ground cover.

(J) If and when the Director declares an air pollution episode as defined in Chapter 38, Section 003.01B, 003.01C, or 003.01D, the owner or operator shall immediately take all required actions listed in Title 129, Appendix I until the Director declares the air pollution episode terminated.

(K) This permit may be revised (reopened and reissued) or revoked for cause in accordance with Title 129 and Title 115, Rules of Practice and Procedure. Conditions under which this permit will be revised or revoked for cause, include but are not limited to: {Chapter 15, Section 006}

(1) A determination by the Director, or the Administrator of EPA that:

(a) the permit must be revised to ensure compliance with the applicable requirements;

(b) the permit contains a material mistake or that inaccurate statements were made in the emissions standards or other terms or conditions of the permit.

(2) The existence at the source of unresolved noncompliance with applicable requirements or a term or condition of the permit, and refusal of the owner or operator to agree to an enforceable schedule of compliance to resolve the noncompliance;

(3) The submittal by the owner or operator of false, incomplete, or misleading information to the NDEQ or EPA;

(4) A determination by the Director that the source or activity endangers human health or the environment and that the danger cannot be removed by a revision of the permit; or

(5) The failure of the owner or operator to pay a penalty owed pursuant to court order, stipulation and agreement, or order issued by the Administrator of the EPA.

## II. SPECIFIC CONDITIONS

(A) The owner/operator of the source shall provide the following notifications to the NDEQ:

(1) The date construction, reconstruction or modification commenced as defined in Chapter 1. Notification shall be postmarked no later than 30 days after such date and include a summary description and whether the requirement to commence construction was met through: {Chapter 17, Section 012}

(a) Initiating physical on-site construction activities of a permanent nature that meet the definition of "begin actual construction", or

(b) Entering into binding agreements or contractual obligations. If this option is used, the notice shall also include a brief summary of each binding agreement or contractual obligation entered into, the date of the agreement or contract, and why it cannot be cancelled or modified without substantial loss to the owner or operator.

(2) The date on which the source or modification first becomes operational, postmarked within 15 days after such date. {Chapter 7, Section 002.03}

(B) Recordkeeping: Records of all measurements, results, inspections, and observations as required to ensure compliance with all applicable requirements shall be maintained on-site as follows:

(1) All calculations and records required throughout this permit shall be completed no later than the fifteenth ($15^{th}$) day of each calendar month and shall include all information through the previous calendar month, unless otherwise specified in this permit.

(2) All records required throughout this permit shall be kept for a minimum of five (5) years and shall be clear and readily accessible to NDEQ representatives, unless otherwise specified in this permit.

(3) Copies of all notifications, reports, test results, and plans.

(4) Calibration records for all operating parameter monitoring equipment.

(5) Operation and Maintenance manuals, or equivalent documentation, detailing proper operation and maintenance of all permitted emission units, required control equipment, and required monitoring equipment shall be kept for the life of the equipment.

(6) Records documenting equipment failures, malfunctions, or other variations, including date and time of occurrence, remedial action taken, and when corrections were made to each piece of permitted equipment, required control equipment, and required monitoring equipment.

(C) All permitted emission units, control equipment, and monitoring equipment shall be properly installed, operated, and maintained. {Chapter 34, Section 006 and Chapter 35 Sections 006.02 and 006.05}

(D) When performance testing is required it shall be completed and submitted to the NDEQ as follows: {Chapter 34}

(1) Performance tests shall be conducted while operating at maximum capacity (operating conditions producing the highest emissions or loading to the control device) within sixty (60) days after first reaching the maximum capacity, but not more than 180 days after the start-up of operations of each unit, unless otherwise specified by the NDEQ.

(2) Testing shall be conducted according to the methodologies found in Title 129, Chapter 34, Section 002, or other NDEQ approved methodologies.

(3) Performance tests shall be conducted for a minimum of three (3) one hour runs unless another run time is specified by the applicable Standard or as deemed appropriate by the NDEQ.

(4) The owner or operator of a source shall provide the NDEQ at least thirty (30) days written notice prior to testing to afford the NDEQ an opportunity to have an observer present. The owner or operator shall also provide the NDEQ with an emissions testing protocol at least thirty (30) days prior to testing. The NDEQ may, in writing, approve a notice of less than 30 days. If the testing is pursuant to an underlying requirement contained in a federal rule, the notice provisions of the underlying requirement apply.

(5) The owner or operator shall monitor and record the operating parameters for process and control equipment during the performance testing required in the permit.

(6) A written copy of the test results signed by the person conducting the test shall be provided to the NDEQ within sixty (60) days of completion of the test unless a different period is specified in the underlying requirements of an applicable Federal Rule and will, at a minimum, contain the following items:

(a) A description of the source's operating parameters (e.g. production rates, firing rates of combustion equipment, fuel usage, etc.), control equipment parameters (e.g. baghouse fan speeds, scrubber liquid flow rates, etc.), and ambient conditions (e.g. weather conditions, etc.) during testing.

(b) Copies of all data sheets from the test run(s).

(c) A description and explanation of any erroneous data or unusual circumstance(s) and the cause for such situation.

(d) A final conclusion section describing the outcome of the testing.

(E) Any emissions due to malfunctions, unplanned shutdowns, and ensuing start-ups that are, or may be, in excess of applicable emission limits shall be reported to the NDEQ in accordance with Chapter 35, Section 005.

(F) The following conditions apply to the verification of NAAQS modeling analysis: {Chapter 4}

(1) The stack dimensions of the following emission points shall be constructed as indicated below:

| Emission Point ID# | Emission Point Name | Minimum Stack Height (ft) | Stack Exit Point Maximum Inside Diameter (m) |
|---|---|---|---|
| EP06 | Digester Biogas Flare | 17.10 | 1.417 |
| EP07 | Biogas Cleanup Skid System | 17.10 | 0.152 |

A site survey, or similar documentation containing the as-built stack dimensions, shall be maintained on-site and kept for the life of the source. If stack dimensions do not comply with the table above, the owner or operator shall notify the NDEQ prior to start-up of any emission unit and, if requested, submit a revised air dispersion modeling analysis to the NDEQ to ensure that the source will not interfere with the attainment or maintenance of the ambient air quality standards in Chapter 4.

(2) The owner or operator shall sufficiently restrict public access to the source at the ambient air boundary relied upon in the air dispersion modeling analysis for the NAAQS compliance demonstration. The vertices of the boundary shall be located at the coordinates indicated below:

| Fence-line Vertex ID# | UTM X (m) | UTM Y (m) |
|---|---|---|
| NW | 711,881.74 | 4,701,538 |
| NE | 712,250.88 | 4,701,550 |
| $SNE_1$ | 712,231.39 | 4,701,454 |
| $SNE_2$ | 712,207.19 | 4,701,390 |
| $SNE_3$ | 712,169.86 | 4,701,335 |
| $SNE_4$ | 712,101.51 | 4,701,269 |
| $SNE_5$ | 712,017.97 | 4,701,208 |
| SW | 711,898.35 | 4,701,139 |

A site survey, or similar documentation containing the locations of the boundary vertices, shall be maintained on-site and kept for the life of the source. If the boundary dimensions do not comply with the table above (plus or minus 5 meters), the owner or operator shall notify the NDEQ prior to start-up of any emission unit and, if requested, submit a revised air dispersion modeling analysis to the NDEQ to ensure that the source will not interfere with the attainment or maintenance of the ambient air quality standards in Chapter 4.

**III.(A) Specific Conditions for Anaerobic Digestion**

(1) Permitted Emission Points: The source is permitted to construct the emission points and associated emission units identified in the following table at the capacity and using the fuel types listed:

| Emission Point ID# | Required Control Equipment ID# and Description | Emission Unit Description | Maximum Capacity (MMBtu/hr) | Permitted Fuel Type |
|---|---|---|---|---|
| EP06 | - | EU06: Digester Biogas Flare | 102.0 | Untreated Biogas |
| | | | 0.1 (pilot) | Natural Gas |
| EP07 | - | EU07: Biogas Cleanup Skid System | - | - |
| EP06 and/or EP07 | EU06: Digester Biogas Flare and/or EU07: Biogas Cleanup Skid System | EU12: Anaerobic Digester #1 | - | - |
| | | EU13: Anaerobic Digester #2 | - | - |

(2) Emission Limitations and Testing Requirements:

The emissions limitations of Chapter 20, Sections 002 and 004 apply to EP06. {Chapter 20}

(3) Operational and Monitoring Requirements and Limitations:

(a) Biogas generated from EU12 and EU13 shall be combusted in EU06 and/or treated in EU07 at all times biogas is being produced. {Chapter 17}

(b) EU06 shall only combust untreated biogas and natural gas. {Chapter 17}

(c) EU06, excluding the pilot, shall be limited to 500 operating hours per any period of twelve (12) consecutive calendar months. At no time during the first eleven (11) months after startup shall the total operating hours for EU06, excluding the pilot, exceed 500 hours. {Chapter 17}

(i) The source shall monitor and record the hours of operation of EU06.

(d) When biogas is being routed to EU06, a flame shall be present in the flare. The facility must install an appropriate safety device or flame monitoring system to ensure that biogas cannot be sent to the flare without the presence of a flame. {Chapter 17}

(e) Observations at least once each day during daylight hours of Biogas Cleanup Skid System operation shall be conducted to determine whether there are visible emissions, leaks, noise, or other indications that corrective action is necessary. If corrective action is required, it shall occur immediately. {Chapter 34}

(4) Applicable NSPS, NESHAP, and MACT Requirements:

The NDEQ has not identified any NSPS, NESHAP, or MACT requirements that apply to the emission points or emission units listed in Condition III.(A)(1).

(5) Reporting and Recordkeeping Requirements:

(a) Records shall be kept documenting the hours of operation for EU06 for each calendar month and for each period of twelve (12) consecutive calendar months.

(b) Records shall be kept documenting the date, time, observations, and corrective actions taken for each day the Biogas Cleanup Skid System is in operation.

**III.(B) Specific Conditions for Emergency Generator Engine**

(1) Permitted Emission Points: The source is permitted to construct the emission point and associated emission unit identified in the following table at the capacity and using the fuel type listed:

| Emission Point ID# | Emission Unit ID# and Description | Maximum Capacity (HP) | Permitted Fuel Type |
|---|---|---|---|
| EP08 | EU08: Emergency Generator Engine | 155 | Natural Gas |

(2) Emission Limitations and Testing Requirements:

(a) The emissions limitations of Chapter 20, Sections 002 and 004 apply to the emission point identified in Condition III.(B)(1). {Chapter 20}

(b) The source shall comply with the applicable emission limitations and testing requirements as specified in 40 CFR Part 60 Subpart JJJJ and 40 CFR Part 63 Subpart ZZZZ for EU08. {Chapters 18 and 28}

(3) Operational and Monitoring Requirements and Limitations

(a) EU08 shall be limited to 500 operating hours per any period of twelve (12) consecutive calendar months. At no time during the first eleven (11) months after startup shall the total operating hours for EU08 exceed 500 hours. {Chapter 17}

(i) EU08 shall be equipped with a non-resettable hour meter to record the operating hours.

(b) The source shall comply with the applicable operational and monitoring requirements and limitations as specified in 40 CFR Part 60 Subparts A and JJJJ and 40 CFR Part 63 Subparts A and ZZZZ for EU08. {Chapters 18 and 28}

(4) Applicable NSPS, NESHAP, and MACT Requirements:

The following standards apply to EU08:

| Applicable Standard | Title | Rule Citation |
|---|---|---|
| NSPS, Subpart A | General Provisions | Title 129, Chapter 18, Sec. 001.01<br>40 CFR 60.1 |
| NSPS, Subpart JJJJ | Stationary Spark Ignition Internal Combustion Engines | Title 129, Chapter 18, Sec. 001.82<br>40 CFR 60.4230 |
| NESHAP, Subpart A | General Provisions | Title 129, Chapter 28, Sec. 001.01<br>40 CFR 63.1 |
| NESHAP, Subpart ZZZZ | Stationary Reciprocating Internal Combustion Engines | Title 129, Chapter 28, Sec. 001.88<br>40 CFR 63.6580 |

(5) Reporting and Recordkeeping Requirements:

(a) The source shall record and maintain records documenting the hours of operation for EU08 for each calendar month and for each period of twelve (12) consecutive calendar months.

(b) The source shall comply with the applicable reporting and recordkeeping requirements as specified in 40 CFR Subparts A and JJJJ and 40 CFR Part 63 Subparts A and ZZZZ for EU08.

## III.(C) Specific Conditions for Paved Haul Roads

(1) Permitted Emission Points:

All on-site haul roads with production-related truck traffic shall be paved. The paved haul roads shall comply with the following conditions. {Chapters 17 and 32}

(2) Emission Limitations and Testing Requirements:

Haul roads are subject to the requirements of Title 129, Chapter 32, Section 002. {Chapter 32}

(3) Operational and Monitoring Requirements and Limitations:

(a) The owner or operator shall utilize best management practices (BMP) on haul roads. The effectiveness of the BMP to minimize emissions from haul roads will be demonstrated by compliance with Condition I.(I). {Chapters 17 and 32}

(b) A survey of the plant property and haul roads shall be conducted for each day of operation during daylight hours to determine if visible fugitive emissions are being generated and leaving plant property. Implementation of BMP shall be taken upon observation of visible fugitive emissions leaving plant property. {Chapter 32}

(4) Applicable NSPS, NESHAP, and MACT Standards:

The NDEQ has not identified any NSPS, NESHAP, or MACT requirements that apply to the haul roads.

(5) Reporting and Recordkeeping Requirements:

(a) Records shall be kept documenting the use of BMP on haul roads.

(b) Records shall be kept documenting the date and time of fugitive dust surveys, whether visible emissions crossed site boundaries, and any corrective action taken if visible emissions are observed in areas to which the public has access.

# Air Quality Construction Permit Application

Facility ID No. 105921

**Big Ox Energy - Siouxland**
Dakota City, Nebraska

HDR Project No. 247429 Task 001

May 2015

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May 15, 2015

Mr. Gary Buttermore, PE
Supervisor, Air Quality Permitting Section
Nebraska Department of Environmental Quality
1200 N Street, Suite 400
PO Box 98922
Lincoln, NE 68509-8922

**RE: Big Ox Energy – Siouxland**
**Facility ID #105921**
**Air Quality Construction Permit Application – Initial**

Dear Mr. Buttermore,

On behalf or Big Ox Energy – Siouxland, please find enclosed copy of a construction permit application for the construction of a new facility located in Dakota City, NE. A CD, with a copy of the entire application in PDF format and screening modeling results, is also enclosed.

The proposed facility will process organic waste material into renewable natural gas. Feedstock from area providers will be anaerobically digested and compressed to clean renewable natural injected into the adjacent natural gas pipeline. Emissions are not expected to exceed major source thresholds.

A construction permit fee in the amount of $250 is provided with this application in accordance with the fee schedule table in NDEQ Title 129, Chapter 17, Section 003.01.

If you have any questions during the review of this application, please feel to contact Mr. Mathew Cole of Big Ox Energy at 920.863.3043.

Sincerely,
HDR Engineering, Inc.

James P. Pavlik
*Project Manager*

cc: Mr. Mathew Cole, Big Ox Energy

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# Nebraska Air Quality Construction Permit Application

## APPLICATION COVER SHEET AND CHECKLIST.

Department of Environmental Quality
Air Quality Division – Construction Permit Unit
P.O. Box 98922, Lincoln, NE 68509-8922
877-834-0474 or 402-471-2189
http://deq.ne.gov/

Facility Name: **Big Ox Energy -Siouxland** Date: **May 2015**

Facility ID# (if known): **105921**

**IMPORTANT: PLEASE READ THE GENERAL INSTRUCTIONS AT THE END OF THIS COVER SHEET**

All applications must also include this completed cover sheet and completeness checklist. Please indicate below which application forms/sections are being included with this Construction Permit Application packet.

***NOTE***- Form 1.0 - 4.0 MUST be completed for each construction permit application. Failure to submit all sections of the forms will make the application incomplete and delay the permitting process significantly.

- ☒ FORM 1.0 – Application General Information
- ☒ FORM 2.0 – Air Dispersion Modeling Information
  - ☒ SECTION 2.1 – Emission Point Summary
  - ☒ SECTION 2.2 – Point Source Information
  - ☒ SECTION 2.3 – Volume Source Information
- ☒ FORM 3.0 – Pollutant Emissions Summary
  - ☒ SECTION 3.1 – Pollutant Emissions Summary (lb/hr)
  - ☒ SECTION 3.2 – Criteria Pollutant Emissions Summary (tons/yr)
  - ☒ SECTION 3.3 – Hazardous Air Pollutant Emissions Summary (tons/yr)
  - ☒ SECTION 3.4 – Greenhouse Gas Emissions Summary (lb/hr)
  - ☒ SECTION 3.5 – Greenhouse Gas Emissions Summary (tons/yr)
  - ☒ SECTION 3.6 – Carbon Dioxide Equivalent Summary (tons/yr)
- ☒ FORM 4.0 – Applicable Federal Requirements
  - ☒ SECTION 4.1 – New Source Performance Standard (NSPS) Requirements
  - ☒ SECTION 4.2 – National Emission Standards for Hazardous Air Pollutant (NESHAP) Requirements
  - ☐ SECTION 4.3 – Prevention of Significant Deterioration (PSD) Requirements
- ☐ FORM 5.0 – Facility Specific Information
  - ☐ SECTION 5.1 – Grain Handling
  - ☐ SECTION 5.2 – Mineral Processing
  - ☐ SECTION 5.3 – Ethanol Production
  - ☐ SECTION 5.4 – Concrete Batch Plant
  - ☐ SECTION 5.5 – Asphalt Production
  - ☐ SECTION 5.6 – Surface Coating
  - ☐ SECTION 5.7 – Natural Gas and Propane Production
  - ☐ SECTION 5.8 – Biodiesel Production
  - ☐ SECTION 5.9 – Fiberglass Manufacturing
  - ☐ SECTION 5.10 – {Reserved}

-Continued on Next Page-

☒ FORM 6.0 – Emission Sources
- ☒ SECTION 6.1 – External Combustion Units
- ☒ SECTION 6.2 – Internal Combustion Units
- ☐ SECTION 6.3 – Incinerators
- ☒ SECTION 6.4 – Uncontrolled Emission Points
- ☐ SECTION 6.5 – Controlled Emission Points without Combustion
- ☐ SECTION 6.6 – Controlled Emission Points with Combustion
- ☐ SECTION 6.7 – Storage Tanks
- ☐ SECTION 6.8 – Cooling Towers
- ☒ SECTION 6.9 – Haul Roads
- ☐ SECTION 6.10 – Equipment Leaks
- ☐ SECTION 6.11 – Storage Piles

☒ FORM 7.0 – Emission Control Devices
- ☒ SECTION 7.1 – Combustion Flare
- ☐ SECTION 7.2 – Thermal Oxidizer (TO)/Regenerative Thermal Oxidizer (RTO)
- ☐ SECTION 7.3 – Baghouse/Cyclone
- ☐ SECTION 7.4 – Scrubber

# Nebraska Air Quality Construction Permit Application

## APPLICATION COVER SHEET AND CHECKLIST

**Application Completeness Checklist** (must be completed for all applications):

a. ☒ The application does not include any confidential information and no application materials are marked confidential. (Pay particular attention to drawings, figures, diagrams, and specification sheets from manufacturers, as these are the most often overlooked materials that have "confidential" stamped on them.)

b. ☐ The application does include confidential information and the appropriate request for confidentiality in accordance with Title 115 – Rules of Practice and Procedure is provided. Refer to the NDEQ Guidance Document titled "Air Quality Confidentiality Claims" available on our website for more information.

c. ☒ The application is typed or filled out using a black or blue pen.

d. ☒ The original application is signed and dated by the responsible official. (Section 1.1)

e. ☒ The relevant sections have been duly marked on the front page of this form and filled out completely to the best of my ability (If you are unsure as to which sections pertain to your facility, please contact the NDEQ).

f. ☒ Instructions for each section have been read thoroughly (If you are unsure as to what information is needed, please contact the NDEQ).

g. ☒ Emissions calculations – calculations of potential emissions (controlled and uncontrolled) of all regulated air pollutants have been provided, with all supporting documentation included and units clearly defined. Include emission factors and their source (i.e. AP-42, FIRE, etc).

h. ☒ Application Fee of the proper amount is enclosed. (Section 1.1)

i. ☒ Air pollution control equipment for each emission point is identified and described. (Section 2.1)

j. ☒ Emission point/stack data is identified and described.

k. ☒ Plant Diagram shows heights and locations of all buildings, property boundaries and location of all stacks and emission points.

l. ☒ Detailed Project Summary clearly outlines the intent and processes at the facility. (Section 1.1)

m. ☒ Ambient Air Quality Analysis is provided, including the modeling data and results, where required (see Modeling Guidance or contact NDEQ). If an analysis is not provided, include an explanation for why it wasn't.

n. ☐ Application is for a Prevention of Significant Deterioration (PSD) permit.

o. ☒ One (1) original and two (2) copies (3 copies for PSD applications) of the complete application have been sent to the proper address. If an electronic version of the application is submitted, only one hard-copy original and one hard-copy copy are required regardless of application type.

p. ☐ Additional information not identified on application forms is included and clearly identified.

I have completed this application cover sheet and completeness checklist and can attest that the accompanying construction permit application materials are complete to the best of my ability. In completing this form, I understand the following: That if any of the required information is not included in this application submittal, the application will be placed in a suspended file until the Department receives the necessary materials and information; That my completion of this Cover Sheet and Checklist does not assure this is a complete application and the Department may request additional information to complete the permit; That by checking the box indicating this application does not include confidential information, the application will be placed in the public files and be subject to public review; and, that the application review will not commence until all required information is received and the application is determined to be complete.

**Jim Pavlik, PE - HDR /** _____ 5/15/15

Name / Signature of Application Preparer — Date

# Nebraska Air Quality Construction Permit Application

## APPLICATION COVER SHEET AND CHECKLIST

**GENERAL INSTRUCTIONS**

The following are general instructions for the completion and submittal of an Air Quality Construction Permit Application. These instructions will not cover the individual Sections in this packet. Instructions for each Section are included at the end of that Section or as a supplemental guidance document. We are continually updating our application forms so please check the NDEQ website frequently for the latest application forms.

**TIMELINESS**

**This application and additional information must be submitted to the Department of Environmental Quality (NDEQ) in sufficient time to allow for its processing prior to the anticipated date of commencement of construction, modification or reconstruction. Your application must be reviewed and a permit must be granted before actual construction can commence. Please use the following timelines as guidance for permit processing: 210 days for PSD-major permits; 150 days for PSD-minor and State Toxic BACT permits; and, 120 days for all others. If an expedited timeframe is desired, please contact the NDEQ to set up a Preapplication Meeting – please see FastTrack Permitting on our website.**

**COMPLETENESS**

All application packets must include this cover sheet and Sections 1.0 - General Information, 2.0 - Air Dispersion Modeling Information, 3.0 – Pollutant Emissions Summary, and 4.0 – Applicable Federal Requirements. The other forms and sections that must be included in the application depend on the type of project that is being proposed (i.e. initial construction permit for a new source, modification of an existing source, historical construction, etc.) and complexity.

On each form or section, the Department requests various types and amounts of information. This information is being requested to expedite the permitting process and to minimize the number of times the permit writer must contact the facility. Because of this, the information should be provided as completely and thoroughly as possible. Any missing or incomplete information will result in a delay in the processing of this application. If you have any questions regarding the forms that should be included with your application submittal, please contact the Air Quality Permitting Hotline (see number below).

**SUPPLEMENTAL INFORMATION**

The Application Completeness Checklist includes a final bullet where the user can indicate whether, or not, they have included supplemental information. In addition, other forms ask for any additional information pertinent to emission control such as flow rates, efficiency of control equipment, type of control equipment, performance standards, output loading, manufacturers guarantees, etc. Please include all additional information that will assist the permit writer in the assessment of the proposal.

**SUBMITTAL**

One original and two copies of the completed Air Quality Construction Permit Application must be submitted. For PSD projects, one original and three copies are required. The Department prefers that the application be double-sided and not be spiral bound, since the bindings will be removed for filing. For ease of review, the Department requests the application also be submitted in electronic format (*.pdf). If an electronic version of the application is submitted, only one original and one paper copy are required regardless of application type. All submittals must be mailed to:

Postal Mail:
Department of Environmental Quality
Air Quality Permitting Section
P.O. Box 98922
Lincoln, NE 68509-8922

Express Mail:
Department of Environmental Quality
Air Quality Permitting Section
1200 N Street, Suite 400
Lincoln, NE 68508

**QUESTIONS**

If you have any questions concerning any portion of the Construction Permit Application packet, please feel free to contact the Air Quality Construction Permit Hotline at (877) 834-0474, the Air Quality Permitting Section at (402) 471-2189 or get additional guidance on our website at http://deq.ne.gov/.

Department of Environmental Quality
Air Quality Division – Construction Permit Unit
P.O. Box 98922, Lincoln, NE 68509-8922
877-834-0474 or 402-471-2189
http://deq.ne.gov/

| NDEQ USE ONLY |
|---|
| **Amount Paid:** |
| **Check #:** |
| **Receipt #:** |
| **Application #:** |

# Nebraska Air Quality Construction Permit Application
## Form 1.0: Construction Permit Application General Information
## Section 1.1: AQ Construction Permit General Information

**IMPORTANT: READ THE INSTRUCTIONS ACCOMPANYING THIS SECTION**
Do **NOT** use pencil to fill out this application. Please type responses or use black ink.

### Administrative Information

| | | | | | |
|---|---|---|---|---|---|
| 1) Facility Name: **Big Ox Energy – Siouxland** | | | 2) NDEQ Facility ID#: **105921** | | |
| 3) Facility SIC Code(s): **2869** | | | 4) Facility NAICS Code(s): **325199** | | |
| 5) Facility Description: **The facility processes organic material into renewable natural gas.** | | | | | |
| 6) Facility Physical Address: **1616 D Avenue** | | | | | |
| 7) Facility City: **Dakota City** | | | 8) State: **Nebraska** | | 9) Zip: **68731** |
| 10) County: **Dakota** | **NW** ¼ | **NW** ¼ | Section: **4** | Township: **28N** | Range: **09E** |
| 11) Indicate the adjacent states that the facility is located within 50 Miles of: ☐ None ☐ Colorado ☒ Iowa ☐ Kansas ☐ Missouri ☒ South Dakota ☐ Wyoming | | | | 12) UTM Coordinates: Zone: **14** X: **711896 E** Y: **4701162 N** | |
| 13) Company Name: **Big Ox Energy – Siouxland, LLC** | | | | | |
| 14) Company Mailing Address: **6601 County Road R** | | | | | |
| 15) Company City: **Denmark** | | | 16) State: WI | | 17) Zip: **54208** |
| 18) Is The Business Incorporated? ☒ No ☐ Yes, State of Incorporation: | | | | | |

### Contact Information

| | |
|---|---|
| 19) Facility Contact Person: **Mathew Cole** | |
| 20) Facility Contact Person's Title or Responsibility: **VP of Engineering** | |
| 21) Phone Number: **920-863-3043**<br>22) Alt. Phone Number: **920-615-2226** | 23) Fax Number: **920-863-5546**<br>24) Email Address: **mcole@bigoxenergy.com** |
| 25) Who is the Primary Contact for Application-related Questions?: ☒ Facility Contact ☐ Other (fill in 25-30 below) | |
| 26) Primary Contact Name: | |
| 27) Primary Contact Company: | |
| 28) Phone Number:<br>29) Alt. Phone Number: | 30) Fax Number:<br>31) Email Address: |
| 32) Hard-copy drafts and the final permit documents should be sent to: ☒ Facility Contact ☐ Other (fill in 32-37 below) | |
| 33) Document Recipient's Name and Title: | |
| 34) Document Recipient's Mailing Address: | |

| | | |
|---|---|---|
| 35) Document Recipient's City: | 36) State: | 37) Zip: |

### Construction Permit Fee Information

38) Construction Permit Application Fee Enclosed (see instructions): ☐ $3,000 ☐ $1,500 ☒ $250 ☐ N/A

Make check payable to: **Nebraska Department of Environmental Quality**
**Memo: Air Quality CP Application Fee**

Nebraska DEQ

# Air Quality Construction Permit Application
# Form 1.0: Application General Information

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921

## Section 1.1: AQ Construction Permit General Information (continued)

### Project Information

39) This Application is For: (Check One)
- a. ☒ Initial Construction Permit for a New Facility
- b. ☐ Modification of an Existing Facility
- c. ☐ Significant Revision of an Existing Construction Permit(s) #: ____
- d. ☐ Historical Construction/Modification

40) Projected Date to Begin Actual Construction: **6/1/2015**

41) Projected Date of Startup:

42) Estimated Cost of Project: **$35,000,000**

### Historical Permitting Information ☒ N/A

43) What year was the facility originally constructed?

44) Enter the date the most recent Air Quality Construction Permit was issued (mm/dd/yyyy):

45) Provide a brief summary of each modification below (Attach additional sheets if needed):

| Date of Modification | Date Permitted | Summary of Modification |
|---|---|---|
| | | |
| | | |

### Source Information

46) Is the existing source classified as a **Major** Prevention of Significant Deterioration (PSD) Source? ☐ Yes ☐ No ☒ N/A

47) Is this project subject to PSD Review? ☐ Yes ☒ No If Yes, complete Section 4.3

48) Is the project subject to State toxic BACT Requirements in Chapter 27? ☐ Yes ☒ No If Yes, attach T-BACT analysis

49) Is the Source subject to NESHAP or MACT Requirements? ☒ Yes ☐ No If Yes, complete Section 4.2

### Attestation of Citizenship

50) Is this application being submitted on behalf of an individual (if Yes go to 51, NO go to 52) ☐ Yes ☒ No

51) Is the applicant a citizen of the United States. ☐ Yes ☐ No

-or-

Is the applicant is a qualified alien under the Federal Immigration and Nationality Act (applicant must provide immigration status, alien number and USICS documentation) ☐ Yes ☐ No

### 52) Responsible Official Certification Statement

I certify under penalty of law that, based on information and belief formed after reasonable inquiry, the statements and information contained in this Air Quality Construction Permit application are true, accurate, and complete. I also certify that all copies, including the electronic copy, of this application are identical in content to the original.

Signature (See Instructions for Signatory Requirements) Date (mm/dd/yyyy): 5-14-2015 CEO/President

Typed or Printed Name: **Robyn Larsen** Title: **President/CEO**

# Air Quality Construction Permit Application
# Form 1.0: Application General Information

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921

## Section 1.1: AQ Construction Permit General Information (continued)

### 53) Project Description (attach directly behind this page)

**For New Facilities**: On a separate sheet(s) of paper, provide a detailed narrative of the proposed construction at the facility. This should include all emission units, processes, and pollution control equipment being constructed. The descriptions must be complete and particular attention must be given in explaining all stages in the process that may result in a discharge of any air pollutant. All obtainable data must be supplied concerning the nature, volume, particle size, weights, chemical composition and concentrations of all types of air pollutants that are expected to be emitted by the source. All emission point, emission unit, and control equipment identification numbers should be present in this description appropriately.

**For Existing Facilities**: On a separate sheet(s) of paper, provide a detailed narrative of the production, operations, processes, and emission units that currently exist at the facility. This should include all emission units, processes, and pollution control equipment that are currently in operation. The descriptions must be complete and particular attention must be given in explaining all stages in the process where there is a discharge of any air pollutant. All obtainable data must be supplied concerning the nature, volume, particle size, weights, chemical composition and concentrations of all types of air pollutants that are emitted by the source. In addition to existing information, narrative of the proposed construction/modification occurring at the source must also be discussed with emphasis on the additions/changes occurring. The same information presented for the existing sources should also be provided for the new construction/modification. Ensure that the narrative is clear as to what is new, existing, and/or being modified. All emission point, emission unit, and control equipment identification numbers should be present in this description appropriately.

### 54) Facility Layout Diagram(s)

On a separate sheet(s) of paper, provide a detailed diagram or site drawing that includes all new and existing buildings, stacks, and emission points identified in this application. Make sure all elements of the drawing are properly identified, drawn to scale, and are consistent with other sections of this application. The plant diagram should indicate the height and location of all buildings/structures and property boundaries. Fences or other public access restrictions should be identified and described. Clearly indicate which elements currently exist and which will be built/installed/modified. Area maps should generally be 1"=500' and detail maps should generally be 1"=50'. An aerial photo with the facility boundary overlay works well in showing the surrounding land use. (See Sample Plant Layout Diagram for an example)

### 55) Process Flow Diagram(s)

On a separate sheet(s) of paper, provide a flow chart that includes all processes, process equipment, emission units, stacks, air pollution control equipment, and fuel burning equipment identified in this application. When finished, this diagram should show how products and materials (including fuel) flow through each process. Make sure all units are identified and properly cross-referenced to match other Sections of the application (including existing units). Provide an inclusive date from which the diagram is valid. Clearly indicate which elements exist and which are new. (See Sample Process Flow Diagram for an example of this document)

### 56) Air Dispersion Modeling Information

Modeling Guidance for determining whether air dispersion modeling may be required can be found on the NDEQ website, or contact the Department for assistance. Please fill out Form 2.0, Sections 2.2 and 2.3 to provide modeling-related information whether or not modeling is submitted to the Department.

Modeling Protocol Not Required

Has an air dispersion modeling protocol been established for this source and reviewed by NDEQ? ☐ Yes ☒ No

Air dispersion modeling and modeling checklist submitted with application? ☒ Yes ☐ No

**Note:** If air dispersion modeling is required but not included with this application, please provide complete modeling submittal and modeling checklist within 30 days to avoid delays in processing this permit application. A delay in submitting the modeling can result in the application being placed on hold and the Department cannot guarantee work will resume immediately upon receipt of modeling. One original and two copies of the modeling submittal are required.

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Big Ox Energy – Siouxland, FID #105921
Construction Permit Application, May 2015
Project Description
Form 1.0, Section 1.1, Item 53

The Big Ox Energy Siouxland (BOES) facility will be located at 1616 D Avenue in Dakota City, Nebraska. The existing site where the facility will be located is a farm field. The new BOES facility will process wastewater and organic wastes from surrounding industries. The majority of wastewater will be delivered to the facility through three forcemains. The wastewater will be treated through a Dissolved Air Floatation (DAF) process and discharged through a forcemain to the municipal sanitary sewer. Solids removed from the DAF process and high strength wastes, received via truck at the site will be processed through an anaerobic digestion system. The biogas produced from the digestion process will be scrubbed, compressed and injected into the existing natural gas pipeline located adjacent to the site. Resultant solids will be dewatered and hauled-out as dewatered cake. The BOES facility will operate throughout the year, 24-hours a day and 7 days per week.

The process is described in more detail below based on liquid processing, solid waste processing, and the biogas system.

• Liquid Processing

The wastewater from three forcemains will be collected in the Dissolved Air Flotation (DAF) Feed Tank. The wastewater from the DAF feed tank will be transferred to the DAF. The solids from the DAF will be sent to the Equalization/Mixing Tank. The effluent wastewater from the DAF will be sent to the sanitary sewer.

• Solid Waste Processing

High strength wastes will be hauled in by truck and unloaded in the receiving area into two hoppers, receiving pits. The waste flows to a Receiving Tank. Packaged and canned food waste will also be hauled in and delivered to the facility at the truck loading dock. The packaged waste will be unloaded into a Turbo Separator. The Turbo Separator separates the organic waste from the packaging material. The organic waste will be sent to the Receiving Tank and the packaging waste will be sent out for disposal.

The waste in the Receiving Tank will be pumped to the Mixing Tank. From the Mixing Tank, the contents will be transferred through a heat exchanger to Digester 1. From Digester 1, the contents will be transferred to Digester 2. From Digester 2, the contents will be sent to the digester effluent tank prior to dewatering.

Two centrifuges will be used to dewater the solids. The centrate from the centrifuges will be sent to the DAF Feed Tank and the solids from the centrifuges will be removed from the site as a dewatered cake via truck.

• Biogas System

The biogas from Digester 1 and Digester 2 will be sent to a Biogas Cleanup Skid outside of the building to be scrubbed and injected into the natural gas pipeline. Scrubbed sulfur will be formed into crystalline sulfur solids which will be removed and washed in a filter press to produce a sulfur by-product for resale.

In the event the biogas cleanup skid is out of service, the biogas will be disposed of through a waste gas burner flare. Biogas will not be scrubbed prior to disposal into the waste gas burner flare.

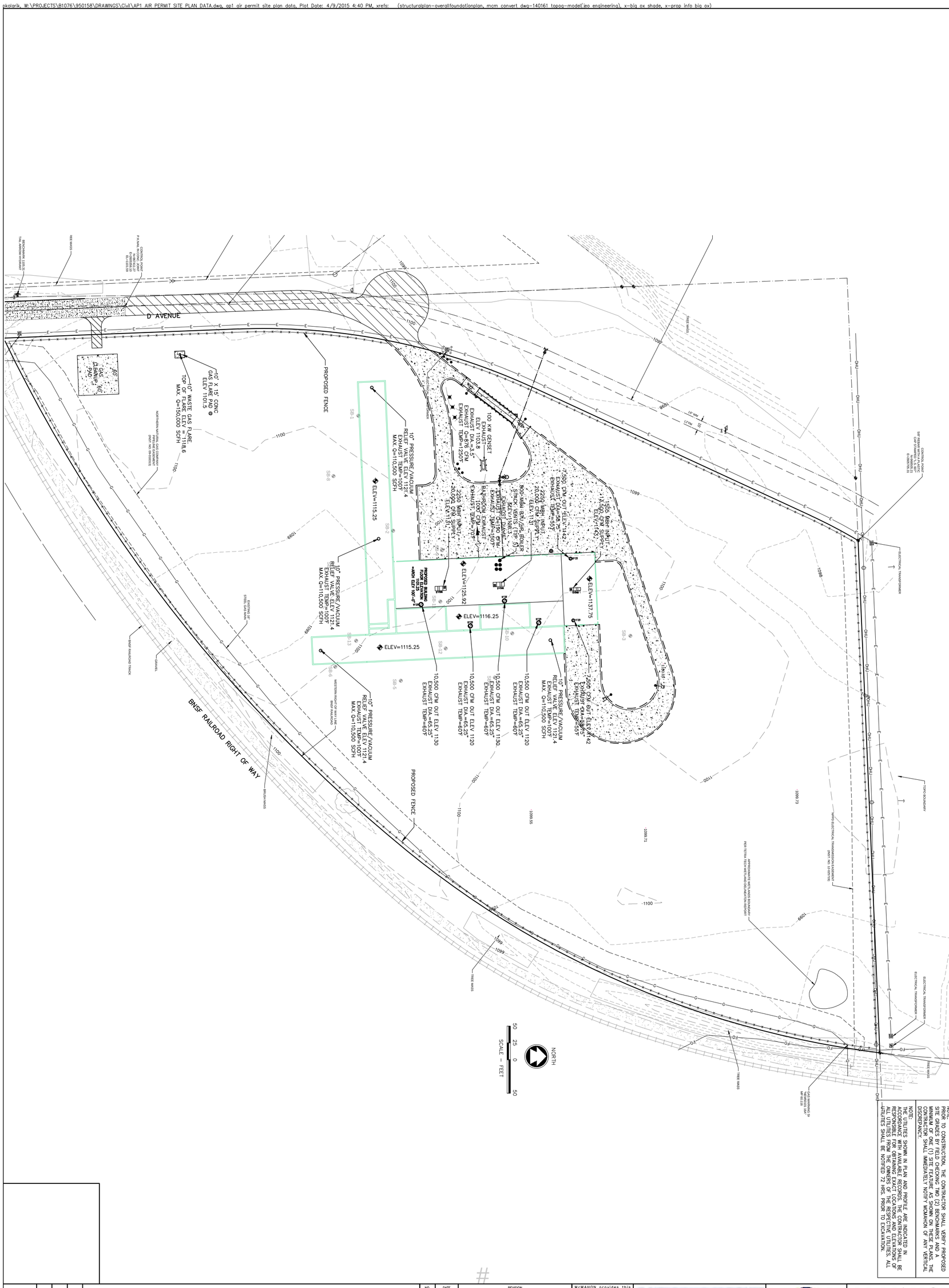
The $H_2S$ removal system will consist of a biogas scrubbing system for removal of $H_2S$. The $H_2S$ will be converted into an elemental sulfur by-product for reuse or disposal. The scrubbed gas will be compressed in an electric powered gas compression system and direct injected into the natural gas transmission line located adjacent to the site. During compression the gas will be further scrubbed to concentrate the methane prior to injecting into the natural gas pipeline. This will result in a compressor tail gas that contains the unwanted portions of the compressed gas that will not be injected into the gas pipeline and will be directly vented to the atmosphere. This tail gas will mainly contain $CO_2$ along with lesser quantities of methane and $H_2S$.

In the event that the biogas cleanup skid is not available, or otherwise cannot be injected into the gas line, the biogas will be directed to an industrial flare. The flare will be permitted for up to 500 hours per year of operation. There are no plans to vent biogas to the atmosphere without the gas either scrubbed by the biogas cleanup skid or combusted in the flare.

The facility will also include five (5) natural gas-fired boilers for generating process steam. The boilers will have a maximum fuel input rate of 800,000 Btu/hr, each. Three (3) natural gas-fired building heaters will be used to maintain adequate conditions within the processing area. Two (2) heaters will have a max fuel input rate of 2.25 MMBtu/hr, each and one (1) heater will be sized at 1.505 MMBtu/hr.

An natural gas fired emergency generator will be installed to provide power to the facility in the event that power for the pumps for the forcemains or other plant systems, is not available.

pkolarik, W:\PROJECTS\B1076\950158\DRAWINGS\Civil\AP1 AIR PERMIT SITE PLAN DATA.dwg, ap1 air permit site plan data, Plot Date: 4/9/2015 4:40 PM, xrefs: (structuralplan-overallfoundationplan, mcm convert dwg-140161 topog-model(leo engineering), x-big ox shade, x-prop info big ox)




NOTE:
PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL VERIFY PROPOSED SITE GRADES BY FIELD CHECKING TWO (2) BENCHMARKS AND AS MANY SPOT ELEVATIONS AS NECESSARY. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY McMAHON OF ANY VERTICAL DISCREPANCY.

NOTE:
THE UTILITIES SHOWN IN PLAN AND PROFILE ARE INDICATED IN ACCORDANCE WITH AVAILABLE RECORDS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING EXACT LOCATIONS AND ELEVATIONS OF ALL UTILITIES FROM THE OWNERS OF THE RESPECTIVE UTILITIES. ALL UTILITIES SHALL BE NOTIFIED 72 HRS PRIOR TO EXCAVATION.

BIG OX ENERGY INC
DAKOTA COUNTY, NEBRASKA
AIR PERMIT SITE PLAN DATA

| NO. | DATE | REVISION |
|---|---|---|
| 1 | 4/9/15 | AIR PERMIT |
| # | # | # |
| # | # | # |
| # | # | # |
| # | # | # |
| # | # | # |



BIG OX ENERGY

Miron Building Excellence

McMAHON
ENGINEERING ARCHITECTURE
1445 McMAHON DRIVE NEENAH, WI 54956
Mailing: P.O.BOX 1025 NEENAH, WI 54957-1025
Tel: (920) 751-4200 Fax: (920) 751-4284
www.mcmgrp.com

| | |
|---|---|
| DESIGNED | RJW |
| DRAWN | MJA |
| PROJECT NO. | B1076-950158 |
| DATE | 02/2015 |
| SHEET NO. | AP1 |

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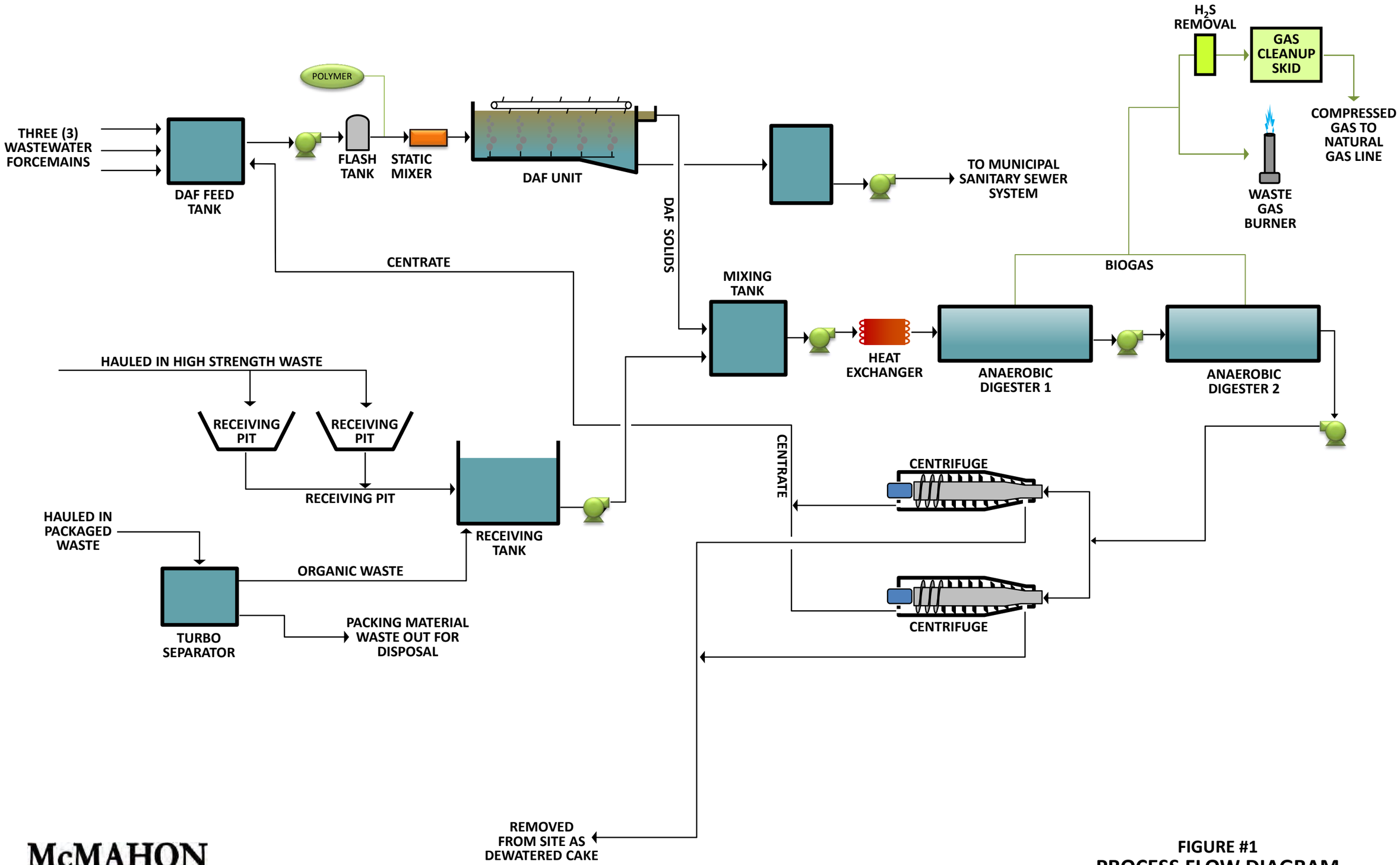


McMAHON ENGINEERS ARCHITECTS

**FIGURE #1**

# PROCESS FLOW DIAGRAM

## BIG OX ENERGY, INC. – SIOUXLAND PROJECT

McM #B1076-950180 3/30/2015

ID: PPT\2015\MCM WIS\BIG OX ENERGY-SIOUXLAND-PROCESS FLOW DIAGRAM.PPTX DEG:jmk

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## 1.1 ANALYSIS OVERVIEW

This air quality impact analysis for the proposed Big Ox Energy – Siouxland project, addresses pollutants for which there exists a Nebraska Ambient Air Quality Standard (NAAQS) and for which modeling is triggered, per NDEQ modeling policy. The criteria pollutants for which modeling is triggered are addressed to demonstrate that the proposed project will not cause or contribute to concentrations above acceptable ambient air levels specified by NAAQS.

### 1.1.1 Model Selection

The latest version of the EPA-preferred AERSCREEN screen model available at the commencement of the project was used for this analysis (Version 14147). AERSCREEN also uses and incorporates the latest version of AERMOD (version 14134), AERMAP (Version 11103), and BPIP-Prime (Version 04274). AERMAP is a terrain preprocessor that incorporates complex terrain using USGS Digital Elevation Data.

The AERSCREEN modeling was performed using the regulatory default mode and using the rural dispersion parameters of the model.

### 1.1.2 Meteorological Data

The meteorological data used for this analysis was prepared using the latest version of MAKEMET (Version 09183). The MAKEMET program generates a site-specific matrix of screening meteorological conditions based on user inputs for input into AERSCREEN.

### 1.1.3 Structural Downwash Input Data

Based upon the location of the stacks being modeled in relation to the structures at the facility it is estimated that structural downwash would be negligible to non-existent for the stacks; so downwash was not analyzed for this modeling.

## 1.2 CRITERIA AIR POLLUTANT ANALYSIS

The air pollutant addressed in this analysis is total reduced sulfur (TRS) as hydrogen sulfide ($H_2S$) as established in Title 129, Chapter 4, Section 007. The Nebraska TRS AAQS is presented in Table 1.1.

**Table 1.1**
**Nebraska Ambient Air Quality Standards**

| POLLUTANT | AVERAGING PERIOD | AMBIENT AIR QUALITY STANDARDS | |
|---|---|---|---|
| | | NATIONAL | NEBRASKA |
| **TRS** | 30-Minute | -- | 0.10 ppm |

Note: Title 129, Chapter 4, Section 004.04B defines attainment of the standard as a 30-minute rolling arithmetic concentration of less than or equal to 0.10 ppm, rounded to two decimal places.

For $H_2S$, the analysis of impacts included emission sources at the Big Ox Energy - Siouxland facility only. There are two emission units at the site that will release $H_2S$ emissions; however, the units will not operate at the same time as there will not be sufficient biogas production at the facility.

### 1.2.1 Receptor Grid

The receptor grid used in the criteria pollutants analysis was established by AERSCREEN starting at approximately 10 meters, which is the distance from each stack location to the nearest point on the perimeter fence at the facility, out to a distance of 10 km.

### 1.2.2 Background Concentrations

For those criteria pollutants with significant impacts from the project, the air quality impact analysis must include the additive effects of background concentrations in estimating total maximum concentration impacts. Since there is no background concentration value for TRS, none will be added to the modeled concentrations.

### 1.2.3 TRS Impact Analysis

The dispersion modeling analysis described in the following sections addresses $H_2S$ for comparison with the Nebraska TRS AAQS. The $H_2S$ dispersion modeling analysis for the 30-minute averaging period considered the emissions from Big Ox Energy – Siouxland operating scenarios only. The modeled emission rates and stack parameters for these emission units are listed in Table 2.2 in Section 2.0 of the permit application forms. The $H_2S$ emission rate for each source listed is equivalent to the proposed emission limit, at the rated capacity of each unit.

The TRS (modeled as $H_2S$) results for the 30-minute averaging period are presented in Table 1.2 below, in comparison to the Nebraska TRS AAQS. The 30-minute results were obtained from the 1-hour average AERSCREEN results by using the "$1/5^{th}$ Power Law", as described in Appendix H of the September 2005 NDEQ Atmospheric Dispersion Modeling Guidance for Permits document. The equation for this conversion is as follows:

$$C_l/C_s = (t_s/t_l)^{1/5}$$

where: $C_l$ = concentration estimate for sampling time, $t_l$ (AERSCREEN results), and
$C_s$ = concentration estimate for shorter sampling time, $t_s$ (Nebr. AAQS).

For $t_l$ = 60 minutes and $t_s$ = 30 minutes, the conversion from AERSCREEN results ($C_l$) to NDEQ TRS AAQS results ($C_s$) is (note that the AERSCREEN results are in terms of $\mu g/m^3$):

$$C_s = C_l/[(30/60)^{1/5}], \text{ or}$$

$$C_s = 1.15\ C_l$$

The impact results in terms of ppm were calculated using the second equation listed in Appendix H of the September 2005 NDEQ Atmospheric Dispersion Modeling Guidance for Permits document. This equation is:

$$ppm = \frac{(C_s)(24.5)}{(MW)(1000)}$$

where: $C_s$ = 30-minute concentration calculated above, expressed in micrograms per cubic meter,

MW = molecular weight of the compounds, expressed in terms of hydrogen sulfide ($MW_{H2S}$ = 34.08 gram/gram-mole)

Therefore:

$$ppm = \frac{(C_s)(24.5)}{(34.08)(1000)}$$

$$ppm = (0.00072)(C_s)$$

**Table 1.2**
**Maximum TRS (as $H_2S$) Impacts Compared to Nebraska TRS AAQS**

| OPERATING SCENARIO EMITTING H2S | MAXIMUM 30-MINUTE IMPACT | | | | NEBRASKA TRS AMBIENT AIR QUALITY STANDARD |
|---|---|---|---|---|---|
| | DISTANCE TO MAXIMUM IMPACT | MODELED IMPACT FOR 60-MIN | 1/5TH POWER LAW CORRECTED TO 30-MIN | | |
| | METERS | µg/m³ | µg/m³ | PPM | PPM |
| Flare 90% $H_2S$ Control | 97.00 | 0.90 | 1.04 | 0.0007 | 0.10 |
| Tail Gas $H_2S$ Uncontrolled | 45.00 | 113.4 | 130.41 | 0.09 | 0.10 |

## 1.3 AIR QUALITY IMPACT SUMMARY

The dispersion modeling results presented above demonstrate that the proposed project emissions will be in compliance with the Nebraska TRS AAQS.

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# Attachment – Air Quality Modeling Checklist

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# Appendix E - Air Quality Modeling Checklist

(Revised February 2006)

Air Quality Modeling Checklist

Air Quality modeling and this checklist should be submitted with your construction permit application. Please check all boxes, which you have completed. If any boxes are left unchecked, please give a brief explanation as to why.

1) General Information

A) ☐ Submittal Date: **May 2015**

B) ☐ Facility Name: **Big Ox Energy - Siouxland**

C) ☐ NDEQ Facility ID Number: **105921**

D) ☐ Facility County Location: **Dakota**

E) Modeling requirement: ☐ Minor Source (State) ☐ Major Source (PSD)

F) ☐ A modeling protocol has been established and reviewed by NDEQ.

2) Pre-Application Monitoring

This section applies only to projects that will undergo PSD review.

A) Do predicted air quality concentrations exceed the applicable pre-application monitoring exemption thresholds shown in the table below?

| Pollutant | Averaging Period | Exemption Threshold ($\mu g/m^3$) |
|---|---|---|
| CO | 8-hour | 575 |
| $NO_2$ | Annual | 14 |
| $PM_{10}$ | 24-hour | 10 |
| $SO_2$ | 24-hour | 13 |
| Pb | Calendar quarter | 0.1 |
| Mercury | 24-hour | 0.25 |
| Beryllium | 24-hour | 0.0001 |
| Fluorides | 24-hour | 0.25 |
| Vinyl chloride | 24-hour | 15 |
| Total reduced sulfur | 1-hour | 10 |
| Hydrogen sulfide | 1-hour | 0.2 |
| Reduced sulfur compounds | 1-hour | 10 |

☐ No. Pre-application monitoring is not required

☐ Yes. Representative air quality monitoring data must be provided to the NDEQ prior to submittal of the permit application, or pre-application monitoring will be required for each pollutant that exceeds the thresholds in the table above.

3) Dispersion Model Selection and Options

A) Which model and version was used?
☐ AERMOD, version:
☐ ISCST3 with PRIME, version:
☐ ISCST3 without PRIME, version:
☐ Calpuff, version:
☐ Other **AERSCREEN**, version: **14147**

Note: The most recent version of a model shall be used unless an older version has been approved by the NDEQ.

B) Regulatory Default Option selected?
☐ Yes
☐ No. Justification for the selection of each non-regulatory default option must be included. Non-regulatory default options selected without prior approval of the NDEQ may result in rejection of the modeling analysis if the justification provided is not sufficient.

C) Pollutants Modeled (mark all that apply)

| | |
|---|---|
| ☐ NOx | ☐ CO |
| ☐ Lead | ☐ SO2 |
| ☐ $PM_{10}$ | ☐ Other: **TRS** |

4) Source Information

A) ☐ A discussion on the proposed operating scenarios and the methodology used to model them has been included.

B) ☐ Tables summarizing the locations, hourly emission rates, and release points for all point, area, volume, and open-pit sources have been included in the modeling analysis report. Building information has been included as well.

C) ☐ All assumptions, calculations, and figures necessary to justify the emission rate, stack height, sides, heights of release, initial dispersion coefficients, and volume have been provided.

D) ☐ For NAAQS modeling, the facility and nearby sources shall use potential emission rates. Reference Tables 8.1 & 8.2 in CFR 40 Part 51 Appendix W.

E) ☐ For PSD Increment modeling, the "project" shall use potential emission rates, the rest of the facility and the nearby sources shall use actual emission rates if available.

F) ☐ All modeling input and output files have been submitted on a CD. This includes met data, BPIP files (if applicable), and any other files used or created during the modeling process.

G) Operational Capacity Limits
☐ 100% capacity.
☐ Less than 100% capacity. This load should be modeled.
In any case, the load causing the highest predicted concentration in addition to the design load should be included in the refined modeling.

H) Varying emission rates used?
☐ Yes. This is not permissible unless the operating restrictions are placed in the permit. Haul road emissions may be allowed to vary. Contact the NDEQ regarding haul road modeling.
☐ No

I) Emission rate scaling factors used in the modeling analysis?
☐ No
☐ Yes. A discussion on how emission scalars were developed must be included. Those scalars which should be identified in any enforceable permit provision (such as restricting hours of operation) should also be included.

J) Have several stack been merged into one stack for modeling purposes?
☐ No
☐ Yes. The merging of existing gas streams is not permissible, and credit for merging cannot be used in the dispersion modeling unless a creditable net emissions reduction is realized by such merging, or another exemption provided under Title 129, Chapter 16 allows for such merging to be credited.

K) Was building downwash evaluated?
☐ No. Justification for not evaluating building downwash must be included.
☐ Yes. The PRIME algorithm should be used to evaluate building downwash effects.

L) Has a plot plan of the facility with the proposed project been included with the modeling submittal or application?
☐ Yes
☐ No. Information on building parameters and locations must be provided in the modeling submittal or permit application.

M) How were haul roads modeled?
☐ Release height equal to half the height of the truck's wheel and an initial vertical dimension based upon the height of the truck divided by 2.15
☐ Other. Provide an explanation as to how the haul roads were modeled.
☐ Haul roads were not modeled. BMP will be utilized.

N) Identify the methodology used to calculate the pound-per-hour haul road emission rate for demonstrating compliance with the 24-hr $PM_{10}$ NAAQS or PSD increment level. Answer only if haul roads were modeled.
☐ Multiplied annual haul road emissions (tons per year) by 2 and divided the result by 8,760 hours. This rate was modeled for each hour of the meteorological period.
☐ Divided annual haul road emission (lb/hr) by 8,760 hours. This rate was modeled for each hour of the meteorological period.
☐ 80% of the annual haul road emissions (tons per year) were assumed to occur during daylight hours (7 am to 7 pm). The remaining 20% of emissions were assumed to occur overnight (7 pm to 7 am).
☐ Other methodology:

5) Receptor Information
☐ Receptors at the facility fenceline are placed at 50 meter intervals.
☐ Receptors beyond the facility fenceline are placed at 50 meter intervals within 200 meters of the facility.
☐ Receptors beyond 200 meters placed at 100 meter intervals out to a distance of 2 kilometers of the facility.
☐ Receptors beyond 2 kilometers placed at 250 meter intervals out to a distance of 5 kilometers

of the facility.
☐ Receptors beyond 5 kilometers placed at 500 meter intervals out to a distance of 7 kilometers of the facility.
☐ Receptors beyond 7 kilometers placed at 1000 meter intervals out to a distance of 10 kilometers of the facility.

6) Terrain Features
A) Was elevated terrain considered in the modeling analysis?
☐ No
☐ Yes. Please indicate how receptor elevations were determined.
i) Which digital elevation model (DEM) was used?
☐ 90 meters; 1 degree
☐ 30 meters; 7.5 minute
☐ Other: **1/3 Arc-Second National Emission Dataset**

B) Which terrain setting was used?
☐ Complex
☐ Simple

C) Which land use setting was used?
☐ Urban
☐ Rural

7) Meteorological Data
☐ The source has acquired the necessary five individual year files and, if modeling $PM_{10}$, the combined 5-yr file.

8) Impact on Air Quality
A) Did modeling analysis include background concentrations as listed below?

| Pollutant | Averaging Period | Background Concentration Value ($\mu g/m^3$) |
|---|---|---|
| $NO_x$ | Annual | 15 |
| $SO_2$ | 3-hour<br>24-hour<br>Annual | 120<br>48<br>12 |
| $PM_{10}$ | 24-hour<br>Annual | 60<br>25 |
| CO | 1-hour<br>8-hour | 7570<br>2330 |
| Pb | Calendar quarter | 0 |

☐ Yes
☐ No. Please discuss how background concentrations were determined. It is recommended that the source receive NDEQ approval to use background concentrations other than those listed in the table above prior to commencing a modeling analysis.

B) ☐ The facility has obtained background source information from NDEQ and has included them in the modeling.

9) Please make sure all information requested in this checklist is included with your submittal. An

incomplete submittal may result in a delay in processing your application.

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# Air Quality Construction Permit Application
# Form 2.0: Emission Point Information

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921

## Section 2.1: Emission Point Summary

**IMPORTANT: READ THE INSTRUCTIONS ACCOMPANYING THIS SECTION BEFORE COMPLETING**
Do **NOT** use pencil to fill out this application. Please type responses or print using black ink.

Complete the following table so that **all** emission points, control equipment, and emission units are accounted for. Use multiple Section 2.1 forms, if needed, so that all emission points, control equipment, and emission units are included. If you have any questions, contact the Nebraska Department of Environmental Quality via the Air Quality Permitting Hotline at (877) 834-0474 or the Air Quality Permitting Section at (402) 471-2189. Source Classification Codes (SCC) are available on the NDEQ website.

Please check ☐ if a separate summary document is used as a replacement for this Section. If a replacement document is used, it must contain all of the information asked for in this form. Identify separate summary document with the title of this Section and attach to this form.

| Emission Point ID# | Control Equipment ID# | Emission Unit ID# | Source Classification Code (SCC) | Previous Emission Point ID# (For existing emission points only) | Emission Source/Process Description |
|---|---|---|---|---|---|
| EP01 | N/A | EU01 | 1-01-006-02 | N/A | Boiler #1 |
| EP02 | N/A | EU02 | 1-01-006-02 | N/A | Boiler #2 |
| EP03 | N/A | EU03 | 1-01-006-02 | N/A | Boiler #3 |
| EP04 | N/A | EU04 | 1-01-006-02 | N/A | Boiler #4 |
| EP05 | N/A | EU05 | 1-01-006-02 | N/A | Boiler #5 |
| EP06 | CE06 | EU06 | 3-01-900-99 | N/A | Compressor Anaerobic Digester (Flare) |
| EP07 | N/A | EU07 | | N/A | Tail Gas Exhaust |
| EP08 | N/A | EU08 | 2-02-002-54 | N/A | Emergency Generator Engine |
| EP09 | N/A | EU09 | 1-01-006-02 | N/A | Make-up Air Unit #1 |
| EP10 | N/A | EU10 | 1-01-006-02 | N/A | Make-up Air Unit #2 |
| EP11 | N/A | EU11 | 1-01-006-02 | | Make-up Air Unit #3 |
| Trucks | N/A | Trucks | | N/A | Haul Road Fugitives |

# Air Quality Construction Permit Application
# Form 2.0: Emission Point Information

**FACILITY NAME:** Big Ox Energy – Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921

## Section 2.2: Air Dispersion Modeling Point Source Information

**IMPORTANT: READ THE INSTRUCTIONS ACCOMPANYING THIS SECTION BEFORE COMPLETING**
Do **NOT** use pencil to fill out this application. Please type responses or print using black ink.

**Point Source Information**

| Emission Point ID# | Emission Point Description | UTM X (m) | UTM Y (m) | Elevation (m) | Stack Height (m) | Temperature of Exhaust (K) | Exit Velocity of Exhaust (m/s) | Inside Diameter of Stack (m) | Flow Rate of Exhaust ($m^3$ / s) |
|---|---|---|---|---|---|---|---|---|---|
| EP06 | Anaerobic Digester (Flare) | 711918.17 | 4701235.26 | 335.7372 | 12.17 | 1273 | 20 | 1.4171 | 31.5443 |
| EP07 | Tail Gas Exhaust | 711919.73 | 4701190.26 | 335.7372 | 5.2121 | 350 | 15.42 | 0.1524 | 0.2813 |
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# Air Quality Construction Permit Application
# Form 2.0: Emission Point Information

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921

## Section 2.3: Air Dispersion Modeling Area and Volume Source Information

**IMPORTANT: READ THE INSTRUCTIONS ACCOMPANYING THIS SECTION BEFORE COMPLETING**
Do **NOT** use pencil to fill out this application. Please type responses or print using black ink.

### Area Source Information

| Emission Point ID# | Emission Point Description | UTM X (m) | UTM Y (m) | Elevation (m) | X-Length (m) | Y-Length (m) | Release Height (m) | Angle (degrees) | Initial Vert. Dimension (m) |
|---|---|---|---|---|---|---|---|---|---|
| N/A | | | | | | | | | |
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### Volume Source Information

| Emission Point ID# | Emission Point Description | UTM X (m) | UTM Y (m) | Elevation (m) | Initial Lateral Dimension (m) | Initial Vertical Dimension (m) | Release Height (m) |
|---|---|---|---|---|---|---|---|
| N/A | | | | | | | |
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# Air Quality Construction Permit Application
# Form 3.0: Emissions Summary

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921

## Section 3.1: Criteria Pollutant Emissions Summary (lb/hour)

**IMPORTANT:** Do **NOT** use pencil to fill out this application. Please type responses or print using blue or black ink.

Complete the following table so that all emission points are accounted for. Use multiple Section 3.1 forms, if needed, so all emission points are included. List each emission point that will emit any of the pollutants listed in the Emission Point ID# column. For each emission point, indicate the quantity, **in pounds per hour**, of criteria pollutants that will be emitted in the respective column. Totals should be the sum of the entire column. If you have any questions, feel free to contact the Nebraska Department of Environmental Quality via the Air Quality Permitting Hotline at (877) 834-0474 or the Air Quality Permitting Section at (402) 471-2189.

Please check ☒ if a separate summary document is used as a replacement for this Form. Identify separate summary document with the title of this Form and attach. This can be a combined summary with Sections 3.2 & 3.3.

| Emission Point ID# | PM (lb/hr) | $PM_{10}$ (lb/hr) | $PM_{2.5}$ (lb/hr) | $NO_x$ (lb/hr) | $SO_x$ (lb/hr) | CO (lb/hr) | VOC (lb/hr) |
|---|---|---|---|---|---|---|---|
| See Attached | | | | | | | |
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# Air Quality Construction Permit Application
# Form 3.0: Emissions Summary

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921

## Section 3.2: Criteria Pollutant Emissions Summary (ton/year)

**IMPORTANT:** Do **NOT** use pencil to fill out this application. Please type responses or print using blue or black ink.

Complete the following table so that all emission points are accounted for. Use multiple Section 3.2 forms, if needed, so all emission points are included. List each emission point that will emit any of the pollutants listed in the Emission Point ID# column. For each emission point, indicate the quantity, **in tons per year**, of criteria pollutants that will be emitted in the respective column. Totals should be the sum of the entire column. If you have any questions, feel free to contact the Nebraska Department of Environmental Quality via the Air Quality Permitting Hotline at (877) 834-0474, or the Air Quality Permitting Section at (402) 471-2189.

Please check ☒ if a separate summary document is used as a replacement for this Form. Identify separate summary document with the title of this Form and attach. This can be a combined summary with Sections 3.1 & 3.3.

| Emission Point ID# | PM (ton/yr) | $PM_{10}$ (ton/yr) | $PM_{2.5}$ (ton/yr) | $NO_x$ (ton/yr) | $SO_x$ (ton/yr) | CO (ton/yr) | VOC (ton/yr) |
|---|---|---|---|---|---|---|---|
| See Attached | | | | | | | |
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# Air Quality Construction Permit Application
# Form 3.0: Emissions Summary

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921

## Section 3.3: Hazardous Air Pollutant Emissions Summary

**IMPORTANT:** Do **NOT** use pencil to fill out this application. Please type responses or print using blue or black ink.

Complete the following table so that all emission points are accounted for. Use multiple Section 3.3 forms, if needed, so all emission points are included. Include the Hazardous Air Pollutants (HAP) that will be emitted in the largest quantities source-wide in the top row. List each emission point that will emit any HAP in the Emission Point ID# column. For each emission point, indicate the quantity, **in tons per year**, of HAP that will be emitted in the respective column. Total HAPs should be the sum of the entire column or row. If you have any questions, feel free to contact the Nebraska Department of Environmental Quality via the Air Quality Permitting Hotline at (877) 834-0474, or the Air Quality Permitting Section at (402) 471-2189.

Please check ☒ if a separate summary document is used as a replacement for this Form. Identify separate summary document with the title of this Form and attach. This can be a combined summary with Sections 3.1 & 3.2.

| Hazardous Air Pollutants → / Emission Point ID# ↓ | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | (ton/yr) | TOTAL HAP (ton/yr) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| See Attached | | | | | | | | | | | | | | |
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| TOTAL HAPs | | | | | | | | | | | | | | |

# Air Quality Construction Permit Application
# Form 3.0: Emissions Summary

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921

## Section 3.4: Greenhouse Gas Emissions Summary (lb/hr)

**IMPORTANT:** Do **NOT** use pencil to fill out this application. Please type responses or print using blue or black ink.

Complete the following table so that all emission points are accounted for. Use multiple Section 3.4 forms, if needed, so all emission points are included. List each emission point that will emit any of the pollutants listed in the Emission Point ID# column. For each emission point, indicate the quantity, in pounds per hour, of criteria greenhouse gas pollutants that will be emitted. Totals should be the sum of the entire column. If you have any questions, contact the Nebraska Department of Environmental Quality via the Air Quality Permitting Hotline at (877) 834-0474 or the Air Quality Permitting Section at (402) 471-2189.

Please check ☒ if a separate summary document is used as a replacement for this Form. Identify separate summary document with the title of this Form and attach. This can be a combined summary with Sections 3.1, 3.2, and 3.3, 3.5. and 3.6

| Emission Point ID# | $CO_2$ (lb/hr) | $CH_4$ (lb/hr) | $N_20$ (lb/hr) | HFC (lb/hr) | PFC (lb/hr) | $SF_6$ (lb/hr) |
|---|---|---|---|---|---|---|
| See Attached | | | | | | |
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# Air Quality Construction Permit Application
# Form 3.0: Emissions Summary
## Section 3.5: Greenhouse Gas Emissions Summary (ton/yr)

**IMPORTANT:** Do **NOT** use pencil to fill out this application. Please type responses or print using blue or black ink.

Complete the following table so that all emission points are accounted for. Use multiple Section 3.1 4 forms, if needed, so all emission points are included. List each emission point that will emit any of the pollutants listed in the Emission Point ID# column. For each emission point, indicate the quantity, in tons per year, of criteria greenhouse gas pollutants that will be emitted. Totals should be the sum of the entire column. If you have any questions, please contact the Nebraska Department of Environmental Quality via the Air Quality Permitting Hotline at (877) 834-0474 or the Air Quality Permitting Section at (402) 471-2189.

Please check ☒ if a separate summary document is used as a replacement for this Form. Identify separate summary document with the title of this Form and attach. This can be a combined summary with Sections 3.1, 3.2, 3.3, 3.4, and 3.6.

| Emission Point ID# | $CO_2$ (ton/yr) | $CH_4$ (ton/yr) | $N_20$ (ton/yr) | HFC (ton/yr) | PFC (ton/yr) | $SF_6$ (ton/yr) |
|---|---|---|---|---|---|---|
| See Attached | | | | | | |
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# Air Quality Construction Permit Application
# Form 3.0: Emissions Summary

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921

## Section 3.6: Carbon Dioxide Equivalent Summary (ton/year)

**IMPORTANT:** Do **NOT** use pencil to fill out this application. Please type responses or print using blue or black ink.

Complete the following table so that all carbon dioxide equivalent ($CO_2e$) emissions are accounted for. For each greenhouse gas pollutant, enter the quantity, in tons per year that will be emitted in the respective column. These emission totals can be obtained from Section 3.5. For each greenhouse gas pollutant multiply the emission rate by the $CO_2e$ emission factor to get the $CO_2e$ emission rate. Once $CO_2e$ emission rates have been determined for all greenhouse gas pollutants, sum all $CO_2e$ emission rates and enter the quantity in the bottom box of the table. If you have any questions, please contact the Nebraska Department of Environmental Quality via the Air Quality Permitting Hotline at (877) 834-0474, or the Air Quality Permitting Section at (402) 471-2189.

Please check ☒ if a separate summary document is used as a replacement for this Form. Identify separate summary document with the title of this Form and attach. This can be a combined summary with Sections 3.1, 3.2, 3.3, 3.4, and 3.5.

| Greenhouse Gas Pollutant | Emission Rate (From Form 3.4) | $CO_2e$ Emission Factor | $CO_2e$ Emission Rate |
|---|---|---|---|
| | (tons/year) | (tons $CO_2e$/ton pollutant) | (tons/year) |
| $CO_2$ | See Attached | 1 | |
| $CH_4$ | | 21 | |
| $N_2O$ | | 310 | |
| HFC | | 11,700 | |
| PFC | | 17,300 | |
| $SF_6$ | | 23,900 | |
| | | Total $CO_2e$ emissions | |

## Source Summary

### Big Ox Energy - Siouxland

### Facility-wide Emissions

| Process or Unit | Pollutants (tons/year) | | | | | | | | Green House Gases (tons/year) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Particulate Matter (PM) | Particulate Matter ($PM_{10}$) | Particulate Matter ($PM_{2.5}$) | Sulfur Oxides ($SO_x$) | Nitrogen Oxides ($NO_x$) | Carbon Monoxide (CO) | Volatile Organic Compounds (VOC) | Hydrogen Sulfide ($H_2S$) | Carbon Dioxide ($CO_2$) | Methane ($CH_4$) | Nitrous Oxide ($N_2O$) | Carbon Dioxide Equivalent ($CO_2e$) |
| EP01 through EP05 - Boilers (Quantity: 5) | 0.13 | 0.13 | 0.13 | 0.01 | 1.72 | 1.44 | 0.09 | -- | 2,061.18 | 0.04 | 0.04 | 2,073.43 |
| EP06 - Anaerobic Digester (Flare) | 0.25 | 0.25 | 0.248 | 1.06 | 0.68 | 0.79 | 0.14 | 0.06 | 1,925.86 | 0.12 | 0.02 | 1,935.88 |
| EP07 - Compressor Tail Gas Exhaust | -- | -- | -- | -- | -- | -- | -- | 3.85 | 14,749.14 | 526.74 | -- | 27,917.61 |
| EP08 - Emergency Generator Engine | 0.00 | 0.00 | 0.003 | 0.000 | 1.42 | 0.11 | 0.04 | -- | 38.20 | 0.00 | 0.00 | 38.24 |
| EP09 through EP11 Make-up Air Units (Quantity: 3) | 0.20 | 0.20 | 0.196 | 0.015 | 2.58 | 2.17 | 0.14 | -- | 3,094.34 | 0.06 | 0.06 | 3,112.73 |
| Trucks - Haul Roads - Fugitive Emissions | 0.71 | 0.14 | 0.03 | | | | | | | | | |
| Facility-wide Emissions | 0.58 | 0.58 | 0.58 | 1.09 | 6.39 | 4.51 | 0.42 | 3.91 | 21,868.71 | 526.96 | 0.12 | 35,077.88 |
| Facility-wide Emissions Including Fugitive Emissions | 1.29 | 0.72 | 0.61 | 1.09 | 6.39 | 4.51 | 0.42 | 3.91 | 21,868.71 | 526.96 | 0.12 | 35,077.88 |

### Facility-wide Hazardous Air Pollutant Emissions (tons/year)

| Hazardous Air Pollutant | Process or Unit | | | | Total Single Hazardous Air Pollutant |
|---|---|---|---|---|---|
| | Boilers (5) | Flare (Total) | Generator Engine | Building Heaters (3) | |
| 1,1,2,2 - Tetrachloroethane | -- | -- | 1.39E-05 | -- | 1.39E-05 |
| 1,1,2 - Trichloroethane | -- | -- | 1.10E-05 | -- | 1.10E-05 |
| 1,3 - Butadiene | -- | -- | 9.27E-05 | -- | 9.27E-05 |
| 1,3 - Dichloropropene | -- | -- | 9.17E-06 | -- | 9.17E-06 |
| 2 - Methylnaphthalene | -- | -- | 1.15E-05 | -- | 1.15E-05 |
| 2,2,4 - Trimethylpentane | -- | -- | 8.68E-05 | -- | 8.68E-05 |
| Acenaphthene | -- | -- | 4.34E-07 | -- | 4.34E-07 |
| Acenaphthylene | -- | -- | 1.92E-06 | -- | 1.92E-06 |
| Acetaldehyde | -- | -- | 2.90E-03 | -- | 2.90E-03 |
| Acrolein | -- | -- | 1.78E-03 | -- | 1.78E-03 |
| Benzene | 3.61E-05 | 9.02E-07 | 1.53E-04 | 1.24E-05 | 1.90E-04 |
| Benzo(b)fluoranthene | -- | -- | 5.76E-08 | -- | 5.76E-08 |
| Benzo(e)pyrene | -- | -- | 1.44E-07 | -- | 1.44E-07 |
| Benzo(g,h,i)perylene | -- | -- | 1.44E-07 | -- | 1.44E-07 |
| Biphenyl | -- | -- | 7.36E-05 | -- | 7.36E-05 |
| Carbon Tetrachloride | -- | -- | 1.27E-05 | -- | 1.27E-05 |
| Chlorobenzene | -- | -- | 1.06E-05 | -- | 1.06E-05 |
| Chloroform | -- | -- | 9.90E-06 | -- | 9.90E-06 |
| Chrysene | -- | -- | 2.41E-07 | -- | 2.41E-07 |
| Dichlorobenzene | 2.06E-05 | 5.15E-07 | -- | 7.06E-06 | 2.11E-05 |
| Ethylbenzene | -- | -- | 1.38E-05 | -- | 1.38E-05 |
| Ethylene Dibromide | -- | -- | 1.54E-05 | -- | 1.54E-05 |
| Fluoranthene | -- | -- | 3.85E-07 | -- | 3.85E-07 |
| Fluorene | -- | -- | 1.97E-06 | -- | 1.97E-06 |
| Formaldehyde | -- | 3.22E-05 | 1.83E-02 | -- | 1.84E-02 |
| **Hexane** | **3.09E-02** | **7.73E-04** | **3.85E-04** | **1.06E-02** | **3.21E-02** |
| Lead Compounds | 8.59E-06 | 2.15E-07 | -- | 2.94E-06 | 8.80E-06 |
| Methanol | -- | -- | 8.68E-04 | -- | 8.68E-04 |
| Methylene Chloride | -- | -- | 6.95E-06 | -- | 6.95E-06 |
| Naphthalene | 1.05E-05 | 2.62E-07 | 2.58E-05 | 3.59E-06 | 3.66E-05 |
| Polycyclic Organic Matter (POM) | 1.51E-06 | 3.79E-08 | -- | 5.19E-07 | 1.55E-06 |
| Polycyclic Aromatic Hydrocarbons (PAH) | -- | -- | 9.34E-06 | -- | 9.34E-06 |
| Phenanthrene | -- | -- | 3.61E-06 | -- | 3.61E-06 |
| Phenol | -- | -- | 8.33E-06 | -- | 8.33E-06 |
| Pyrene | -- | -- | 4.72E-07 | -- | 4.72E-07 |
| Styrene | -- | -- | 8.20E-06 | -- | 8.20E-06 |
| Tetrachloroethane | -- | -- | 8.61E-07 | -- | 8.61E-07 |
| Toluene | 5.84E-05 | 1.46E-06 | 1.42E-04 | 2.00E-05 | 2.02E-04 |
| Vinyl Chloride | -- | -- | 5.17E-06 | -- | 5.17E-06 |
| Xylene | -- | -- | 6.39E-05 | -- | 6.39E-05 |
| Arsenic Compounds (ASC) | 3.44E-06 | 8.59E-08 | -- | 1.18E-06 | 3.52E-06 |
| Beryllium Compounds (BEC) | 2.06E-07 | 5.15E-09 | -- | 7.06E-08 | 2.11E-07 |
| Cadmium Compounds (CDC) | 1.89E-05 | 4.72E-07 | -- | 6.48E-06 | 1.94E-05 |
| Chromium Compounds (CRC) | 2.40E-05 | 6.01E-07 | -- | 8.24E-06 | 2.46E-05 |
| Cobalt Compounds (COC) | 1.44E-06 | 3.61E-08 | -- | 4.95E-07 | 1.48E-06 |
| Manganese Compounds (MNC) | 6.53E-06 | 1.63E-07 | -- | 2.24E-06 | 6.69E-06 |
| Mercury Compounds (HGC) | 4.47E-06 | 1.12E-07 | -- | 1.53E-06 | 4.58E-06 |
| Nickel Compounds (NIC) | 3.61E-05 | 9.02E-07 | -- | 1.24E-05 | 3.70E-05 |
| Selenium Compounds (SEC) | 4.12E-07 | 1.03E-08 | -- | 1.41E-07 | 4.23E-07 |
| Total HAPS | 3.11E-02 | 8.11E-04 | 2.51E-02 | 1.07E-02 | |

| | |
|---|---|
| Total Hazardous Air Pollutants: | **0.06** |
| Largest Single HAP: | **0.03** |

## Boiler Emissions

**Big Ox Energy - Siouxland**
**Emission Point ID#: EP01, EP02, EP03, EP04, and EP05**

### Combustion Emissions

Natural Gas Combustion Emissions from Boilers (Five (5) 0.8 MMBtu/hr Units)

| | | | | |
|---|---|---|---|---|
| Individual Heat Input Capacity | 0.8 | MMBtu/hr | (Boiler Vendor) | |
| Total Heat Input Capacity | 4.0 | MMBtu/hr = | 35,040 | MMBtu/yr |
| Heat Content of Natural Gas (HHV) | 1,020 | Btu/scf | | |
| AP-42, Table 1.4-1, Footnote a | | | | |
| Potential Natural Gas Throughput | | | | |
| Individual Boiler | 0.001 | MMscf/hr = | 6.87 | MMscf/yr |
| Total | 0.004 | MMscf/hr = | 34.35 | MMscf/yr |

| Pollutant | Emission Factor[1] | Potential Emission Rate (lbs/hr) | | Potential Emission Rate (tons/year) | |
|---|---|---|---|---|---|
| | (lb/MMscf) | Individual Boiler | Total | Individual Boiler | Total |
| Particulate Matter ($PM/PM_{10}$) | 7.6 | 0.006 | 0.030 | 0.026 | 0.13 |
| Particulate Matter ($PM_{2.5}$) | 7.6 | 0.006 | 0.030 | 0.026 | 0.13 |
| Sulfur Dioxide ($SO_2$) | 0.6 | 0.000 | 0.002 | 0.002 | 0.01 |
| Nitrogen Oxides ($NO_x$) | 100 | 0.078 | 0.392 | 0.344 | 1.72 |
| Carbon Monoxide (CO) | 84 | 0.066 | 0.329 | 0.289 | 1.44 |
| Volatile Organic Compounds (VOC) | 5.5 | 0.004 | 0.022 | 0.019 | 0.09 |
| Green House Gas Emissions (GHGs)[2] | | | | | |
| Carbon Dioxide ($CO_2$), GWP = 1 | 120,000 | 94.12 | 470.59 | 412.24 | 2,061.18 |
| Methane ($CH_4$), GWP = 25 | 2.3 | 0.00 | 0.01 | 0.01 | 0.04 |
| Nitrous Oxide ($N_2O$), GWP = 298 | 2.2 | 0.00 | 0.01 | 0.01 | 0.04 |
| Total GHG as $CO_2e$ | | 94.68 | 473.38 | 414.69 | 2,073.43 |
| Individual Hazardous Air Pollutants (HAP) | | | | | |
| Benzene | 0.0021 | 1.65E-06 | 8.24E-06 | 7.21E-06 | 3.61E-05 |
| Dichlorobenzene | 0.0012 | 9.41E-07 | 4.71E-06 | 4.12E-06 | 2.06E-05 |
| Hexane | 1.8 | 1.41E-03 | 7.06E-03 | 6.18E-03 | 3.09E-02 |
| Lead Compounds | 0.0005 | 3.92E-07 | 1.96E-06 | 1.72E-06 | 8.59E-06 |
| Naphthalene | 0.00061 | 4.78E-07 | 2.39E-06 | 2.10E-06 | 1.05E-05 |
| Polycyclic Organic Matter (POM) | 0.0000882 | 6.92E-08 | 3.46E-07 | 3.03E-07 | 1.51E-06 |
| Toluene | 0.0034 | 2.67E-06 | 1.33E-05 | 1.17E-05 | 5.84E-05 |
| Arsenic Compounds (ASC) | 0.0002 | 1.57E-07 | 7.84E-07 | 6.87E-07 | 3.44E-06 |
| Beryllium Compounds (BEC) | 0.000012 | 9.41E-09 | 4.71E-08 | 4.12E-08 | 2.06E-07 |
| Cadmium Compounds (CDC) | 0.0011 | 8.63E-07 | 4.31E-06 | 3.78E-06 | 1.89E-05 |
| Chromium Compounds (CRC) | 0.0014 | 1.10E-06 | 5.49E-06 | 4.81E-06 | 2.40E-05 |
| Cobalt Compounds (COC) | 0.000084 | 6.59E-08 | 3.29E-07 | 2.89E-07 | 1.44E-06 |
| Manganese Compounds (MNC) | 0.00038 | 2.98E-07 | 1.49E-06 | 1.31E-06 | 6.53E-06 |
| Mercury Compounds (HGC) | 0.00026 | 2.04E-07 | 1.02E-06 | 8.93E-07 | 4.47E-06 |
| Nickel Compounds (NIC) | 0.0021 | 1.65E-06 | 8.24E-06 | 7.21E-06 | 3.61E-05 |
| Selenium Compounds (SEC) | 0.000024 | 1.88E-08 | 9.41E-08 | 8.24E-08 | 4.12E-07 |
| Total HAPs | | 0.001 | 0.007 | 0.006 | 0.031 |

[1]Emission Factors from AP-42 Tables 1.4-1, 1.4-2, 1.4-3 and 1.4-4 (7/98)

[2]The Global Warming Potentials (GWP) are from 40 CFR Part 98 Table A-1 to Subpart A.

# Flare Emissions

**Big Ox Energy - Siouxland**
**Emission Point ID#: EP06**

**Biogas Flaring Emissions**

Assumptions

- At Standard Conditions, Weight Concentration, $mg/m^3$ = ppm x $MW_{H2S}$/molar volume of gas

- Uncontrolled Emission Rate, lb/hr = Weight Concentration x (g/1000 mg) x (lb/453.6 g) x ($m^3$/35.313 $ft^3$) x gas flow (scf/min) x (60 min/hr)

| | | | |
|---|---|---|---|
| Volume Concentration, $H_2S$ (provided by source) | 300 | ppm | (Highest monitored value from Big Ox Energy - Denmark facility |
| Molecular Weight (MW), $H_2S$ | 34 | g/mole | plus a safety factor) |
| Molecular Weight (MW), Biogas | 24.96 | g/mole | |
| 1 Molar volume of gas (at standard condition) | 24.45 | liters | |

| Component | Percentage | Molecular Weight | |
|---|---|---|---|
| Methane | 68% | 16 g/mol | (Highest monitored value from |
| Carbon Dioxide | 32.0% | 44 g/mol | Big Ox Energy - Denmark facility) |
| $H_2S$ | 0.0300% | 34 g/mol | |
| $SO_2$ | -- | 64 g/mol | |

| | | | |
|---|---|---|---|
| Weight Concentration, $H_2S$ | 417 | $mg/m^3$ | |
| Bioas Flow Rate - Maximum Design Value | 1600.82 | scf/min | (Maximum design value) |
| Biogas Flow Rate - Maximum Hourly | 0.0960492 | MMscf/hr | |
| Methane Flow Rate - Maximum Hourly | 0.065313456 | MMscf/hr | |
| Biogas Flow Rate - Annual Maximum | 841.39 | MMscf/yr | |
| Methane Flow Rate - Annual Maximum | 572.15 | MMscf/yr | |
| Uncontrolled Emission Rate, $H_2S$ | 2.50 | lb/hr | |
| Uncontrolled Emission Rate, $H_2S$<br>Based on 8,760 operating hours | 10.96 | ton/year | (Assumes full-time flaer operation (8760 hrs/yr)) |
| Estimated Flare Control Efficiency<br>Conversion of $H_2S$ to $SO_2$ | 90% | | |
| Controlled Emission Rate, $H_2S$ | 0.2502 | lb/hr | |
| Controlled Emission Rate, $H_2S$ | 1.0957 | ton/year | (Assumes full-time flaer operation (8760 hrs/yr)) |
| Heat Content of Methane | 1,000 | Btu/scf | |
| Heat Content of Biogas | 680 | Btu/scf | |
| Operating Time | 500 | hours/year | (Proposed limit to flare operation) |
| Calculated Biogas Heat Input of Flare - Max Hourly<br>[Gas Flow Rate (MMscf/hr) x Heat Content of Biogas (Btu/scf)] | 65.31 | MMBtu/hr | |
| Calculated Biogas Heat Input of Flare - Annual Max<br>[Gas Flow Rate (MMscf/hr) x Heat Content of Biogas (Btu/scf)] | 572,146 | MMBtu/yr | |
| Calculated Methane Heat Input of Flare - Max Hourly<br>[Methane Flow Rate (MMscf/hr) x Heat Content of Methane (Btu/scf)] | 4 | MMBtu/hr | |
| Calculated Methane Heat Input of Flare - Annual Max<br>[Methane Flow Rate (MMscf/hr) x Heat Content of Methane (Btu/scf)] | 572,146 | MMBtu/yr | |

| Pollutant | Emission Factors[1] | | Potential Emission Rate (lbs/hr) | Potential Emission Rate (tons/year) | Limited Operation Potential Emission Rate (tons/yr) |
|---|---|---|---|---|---|
| Particulate Matter ($PM/PM_{10}$) | 15 | lb/MMdscf Methane | 0.98 | 4.29 | 0.24 |
| Particulate Matter ($PM_{2.5}$) | 15 | lb/MMdscf Methane | 0.98 | 4.29 | 0.24 |
| Sulfur Dioxide ($SO_2$) | 4.24 | lb/hr[2] | 4.24 | 18.56 | 1.06 |
| Nitrogen Oxides ($NO_x$) | 39 | lb/MMdscf Methane | 2.55 | 11.16 | 0.64 |
| Carbon Monoxide (CO) | 46 | lb/MMdscf Methane | 3.00 | 13.16 | 0.75 |
| Volatile Organic Compounds (VOC) | 0.14 | lb/MMBtu Methane | 0.56 | 40.05 | 0.14 |
| Hydrogen Sulfide ($H_2S$) | 0.2502 | lb/hr[3] | 0.25 | 1.10 | 0.06 |
| Green House Gas Emissions (GHGs)[4],[5] | | | | | |
| Carbon Dioxide ($CO_2$), GWP = 1 | 114.79 | lb/MMBtu Biogas | 7,497.33 | 32,838.31 | 1,874.33 |
| Methane ($CH_4$), GWP = 25 | 0.0071 | lb/MMBtu Biogas | 0.46 | 2.03 | 0.12 |
| Nitrous Oxide ($N_2O$), GWP = 298 | 0.0014 | lb/MMBtu Biogas | 0.09 | 0.40 | 0.02 |
| Total GHG as $CO_2e$ | -- | -- | 7,536.17 | 33,008.44 | 1,884.04 |

[1]Emission Factors for $NO_x$, CO, PM, PM10, and PM2.5 taken from AP-42 Table 2.4-4 (Draft 10/08) and VOC from AP-42 Tables 13.5-1 and 13.5-2 (9/91), $SO_2$ and $H_2S$ established from information/calculation above

[2]$SO_2$ Emission Factor (lb/hr) = Uncontrolled Emission Rate, $H_2S$ (lb/hr) x Estimated Control Efficiency (%) x ($MW_{SO2}/MW_{H2S}$)

[3]$H_2S$ Emission Factor (lb/hr) = Uncontrolled Emission Rate, $H_2S$ (lb/hr) x Estimated Control Efficiency (%)

[4]Emission Factors for $CO_2$, $CH_4$ and $N_2O$, from 40 CFR 98 Tables C-1 and C-2

[5]The Global Warming Potentials (GWP) are from 40 CFR Part 98 Table A-1 to Subpart A.

# Flare Emissions

**Big Ox Energy - Siouxland**
**Emission Point ID#: EP06**

**Pilot Emissions**

| | | |
|---|---|---|
| Total Heat Input Capacity of Pilot | 0.1 | MMBtu/hr |
| Heating Value | 1020 | Btu/scf |
| Operating Time | 8760 | hr/yr |
| Total Natural Gas Usage | 0.0001 | MMscf/hr |

| Pollutant | Emission Factor[1] (lb/MMscf) | Potential Emission Rate (lbs/hr) | Potential Emission Rate (tons/year) |
|---|---|---|---|
| Particulate Matter ($PM/PM_{10}$) | 7.6 | 0.0007 | 0.0033 |
| Particulate Matter ($PM_{2.5}$) | 7.6 | 0.0007 | 0.0033 |
| Sulfur Dioxide ($SO_2$) | 0.6 | 0.0001 | 0.0003 |
| Nitrogen Oxides ($NO_x$) | 100 | 0.0098 | 0.0429 |
| Carbon Monoxide (CO) | 84 | 0.0082 | 0.0361 |
| Volatile Organic Compounds (VOC) | 5.5 | 0.0005 | 0.0024 |
| Greenhouse Gas Emissions (GHGs)[2] | | | |
| Carbon Dioxide ($CO_2$), GWP = 1 | 120,000 | 11.7647 | 51.53 |
| Methane ($CH_4$), GWP = 25 | 2.3 | 0.0002 | 0.0010 |
| Nitrous Oxide ($N_2O$), GWP = 298 | 2.2 | 0.0002 | 0.0009 |
| Total GHG as $CO_2e$ | | 11.83 | 51.84 |
| Individual Hazardous Air Pollutants (HAP) | | | |
| Benzene | 0.0021 | 2.06E-07 | 9.02E-07 |
| Dichlorobenzene | 0.0012 | 1.18E-07 | 5.15E-07 |
| Formaldehyde | 0.075 | 7.35E-06 | 3.22E-05 |
| Hexane | 1.8 | 1.76E-04 | 7.73E-04 |
| Lead Compounds | 0.0005 | 4.90E-08 | 2.15E-07 |
| Naphthalene | 0.00061 | 5.98E-08 | 2.62E-07 |
| Polycyclic Organic Matter (POM) | 0.0000882 | 8.65E-09 | 3.79E-08 |
| Toluene | 0.0034 | 3.33E-07 | 1.46E-06 |
| Arsenic Compounds (ASC) | 0.0002 | 1.96E-08 | 8.59E-08 |
| Beryllium Compounds (BEC) | 0.000012 | 1.18E-09 | 5.15E-09 |
| Cadmium Compounds (CDC) | 0.0011 | 1.08E-07 | 4.72E-07 |
| Chromium Compounds (CRC) | 0.0014 | 1.37E-07 | 6.01E-07 |
| Cobalt Compounds (COC) | 0.000084 | 8.24E-09 | 3.61E-08 |
| Manganese Compounds (MNC) | 0.00038 | 3.73E-08 | 1.63E-07 |
| Mercury Compounds (HGC) | 0.00026 | 2.55E-08 | 1.12E-07 |
| Nickel Compounds (NIC) | 0.0021 | 2.06E-07 | 9.02E-07 |
| Selenium Compounds (SEC) | 0.000024 | 2.35E-09 | 1.03E-08 |
| Total HAPs | | 0.0002 | 0.0008 |

[1]Emission Factors from AP-42 Tables 1.4-1. 1.4-2, 1.4-3 and 1.4-4 (7/98)

[2]The Global Warming Potentials (GWP) are from 40 CFR Part 98 Table A-1 to Subpart A.

# Flare Emissions

**Big Ox Energy - Siouxland**
**Emission Point ID#: EP06**

**Total Flare Emissions**

| Pollutant | Potential Emission Rate: Biogas Combustion (lb/hr) | Potential Emission Rate: Pilot (lb/hr) | Total Potential Emission Rate (lb/hr) | Total Potential Emission Rate (tons/year) | Limited Operation Potential Emission Rate (tons/yr) |
|---|---|---|---|---|---|
| Particulate Matter ($PM/PM_{10}$) | 0.98 | 0.0007 | 0.98 | 4.29 | 0.25 |
| Particulate Matter ($PM_{2.5}$) | 0.98 | 0.0007 | 0.98 | 4.29 | 0.25 |
| Sulfur Dioxide ($SO_2$) | 4.24 | 0.0001 | 4.24 | 18.56 | 1.06 |
| Nitrogen Oxides ($NO_x$) | 2.55 | 0.0098 | 2.56 | 11.20 | 0.68 |
| Carbon Monoxide (CO) | 3.00 | 0.0082 | 3.01 | 13.20 | 0.79 |
| Volatile Organic Compounds (VOC) | 0.56 | 0.0005 | 0.56 | 40.05 | 0.14 |
| Hydrogen Sulfide ($H_2S$) | 0.25 | -- | 0.25 | 1.10 | 0.06 |
| Greenhouse Gas Emissions (GHGs) | | | | | |
| Carbon Dioxide ($CO_2$), GWP = 1 | 7,497.33 | 11.76 | 7,509.10 | 32,889.84 | 1,925.86 |
| Methane ($CH_4$), GWP = 25 | 0.46 | 0.0002 | 0.46 | 2.03 | 0.12 |
| Nitrous Oxide ($N_2O$), GWP = 298 | 0.09 | 0.0002 | 0.09 | 0.40 | 0.02 |
| Total GHG as $CO_2e$ | 7,536.17 | 11.83 | 7,548.01 | 33,060.28 | 1,935.88 |
| Individual Hazardous Air Pollutants (HAP) | | | | | |
| Benzene | -- | 2.06E-07 | 2.06E-07 | 9.02E-07 | 9.02E-07 |
| Dichlorobenzene | -- | 1.18E-07 | 1.18E-07 | 5.15E-07 | 5.15E-07 |
| Formaldehyde | -- | 7.35E-06 | 7.35E-06 | 3.22E-05 | 3.22E-05 |
| Hexane | -- | 1.76E-04 | 1.76E-04 | 7.73E-04 | 7.73E-04 |
| Lead Compounds | -- | 4.90E-08 | 4.90E-08 | 2.15E-07 | 2.15E-07 |
| Naphthalene | -- | 5.98E-08 | 5.98E-08 | 2.62E-07 | 2.62E-07 |
| Polycyclic Organic Matter (POM) | -- | 8.65E-09 | 8.65E-09 | 3.79E-08 | 3.79E-08 |
| Toluene | -- | 3.33E-07 | 3.33E-07 | 1.46E-06 | 1.46E-06 |
| Arsenic Compounds (ASC) | -- | 1.96E-08 | 1.96E-08 | 8.59E-08 | 8.59E-08 |
| Beryllium Compounds (BEC) | -- | 1.18E-09 | 1.18E-09 | 5.15E-09 | 5.15E-09 |
| Cadmium Compounds (CDC) | -- | 1.08E-07 | 1.08E-07 | 4.72E-07 | 4.72E-07 |
| Chromium Compounds (CRC) | -- | 1.37E-07 | 1.37E-07 | 6.01E-07 | 6.01E-07 |
| Cobalt Compounds (COC) | -- | 8.24E-09 | 8.24E-09 | 3.61E-08 | 3.61E-08 |
| Manganese Compounds (MNC) | -- | 3.73E-08 | 3.73E-08 | 1.63E-07 | 1.63E-07 |
| Mercury Compounds (HGC) | -- | 2.55E-08 | 2.55E-08 | 1.12E-07 | 1.12E-07 |
| Nickel Compounds (NIC) | -- | 2.06E-07 | 2.06E-07 | 9.02E-07 | 9.02E-07 |
| Selenium Compounds (SEC) | -- | 2.35E-09 | 2.35E-09 | 1.03E-08 | 1.03E-08 |
| Total HAPs | -- | 0.0002 | 0.0002 | 0.0008 | 0.0008 |

# Compressor Tail Gas Emissions

**Big Ox Energy - Siouxland**
**Emission Point ID#: EP07**

**Compressor Tail Gas Exhaust**

Assumptions

- At Standard Conditions, Weight Concentration, $mg/m^3$ = ppm x $MW_{H2S}$/molar volume of gas
- Uncontrolled Emission Rate, lb/hr = Weight Concentration x (g/1000 mg) x (lb/453.6 g) x ($m^3$/35.313 $ft^3$) x gas flow (scf/min) x (60 min/hr)

| | | | |
|---|---|---|---|
| Volume Concentration, $H_2S$ (provided by source) | 300 | ppm | |
| Molecular Weight (MW), $H_2S$ | 34 | g/mole | |
| Molecular Weight (MW), Tail Gas | 40.52 | g/mole | (Molecular weight based on gas concentration below) |
| 1 Molar volume of gas (at standard condition) | 24.45 | liters | |

| Component | Percentage | Molecular Weight |
|---|---|---|
| Methane | 8.73% | 16 g/mol (Percentage from vendor cut sheets for gas cleanup skid) |
| Carbon Dioxide | 88.9% | 44 g/mol |
| $H_2S$ | 0.0300% | 34 g/mol |
| $SO_2$ | -- | 64 g/mol |

| | | |
|---|---|---|
| Weight Concentration, $H_2S$ | 417 | $mg/m^3$ |
| Weight Concentration, Methane | 57,129 | $mg/m^3$ |
| Weight Concentration, Carbon Dioxide | 1,599,656 | $mg/m^3$ |
| Gas Flow Rate - Maximum Hourly | 596 | scf/min |
| Gas Flow Rate - Maximum Hourly | 0.035760 | MMscf/hr |
| Methane Flow Rate - Maximum Hourly | 0.003121848 | MMscf/hr |
| Gas Flow Rate - Annual Maximum | 313.26 | MMscf/yr |
| Methane Flow Rate - Annual Maximum | 27.35 | MMscf/yr |
| Uncontrolled Emission Rate, $H_2S$ | 0.93 | lb/hr |
| Uncontrolled Emission Rate, $H_2S$<br>Based on 8,760 operating hours | 4.08 | ton/year |
| Uncontrolled Emission Rate, Methane | 127.54 | lb/hr |
| Uncontrolled Emission Rate, Methane<br>Based on 8,760 operating hours | 558.62 | ton/year |
| Uncontrolled Emission Rate, Carbon Dioxide | 3571.22 | lb/hr |
| Uncontrolled Emission Rate, Carbon Dioxide<br>Based on 8,760 operating hours | 15641.94 | ton/year |
| Estimated Flare Control Efficiency<br>Conversion of $H_2S$ to $SO_2$ | 0% | |
| Operating Time | 8260 | hours/year |

| Pollutant | Emission Factors | | Potential Emission Rate (lbs/hr) | Potential Emission Rate (tons/year) | Limited Operation Potential Emission Rate (tons/yr) |
|---|---|---|---|---|---|
| Hydrogen Sulfide ($H_2S$) | 0.9313 | lb/hr[1] | 0.93 | 4.08 | 3.85 |
| Green House Gas Emissions (GHGs)[2],[3] | | | | | |
| Carbon Dioxide ($CO_2$), GWP = 1 | 3571.22 | lb/hr | 3,571.22 | 15,641.94 | 14,749.14 |
| Methane ($CH_4$), GWP = 25 | 127.5396 | lb/hr | 127.54 | 558.62 | 526.74 |
| Total GHG as $CO_2e$ | -- | -- | 6,759.71 | 29,607.53 | 27,917.61 |

[3] $H_2S$ Emission Factor (lb/hr) = Uncontrolled Emission Rate, $H_2S$ (lb/hr) x Estimated Control Efficiency (%)

[4] Emission Factors for $CO_2$ and $CH_4$, from Uncontrolled Emission Rate (lb/hr) x Estimated Control Efficiency (%)

[5] The Global Warming Potentials (GWP) are from 40 CFR Part 98 Table A-1 to Subpart A.

# Emergency Generator Engine

**Big Ox Energy - Siouxland**
**Emission Point ID#: EP08**

**Internal Combustion of 4-Stroke Lean-Burn Natural Gas in Engines (100 hp < x < 250 hp)**

| | | | |
|---|---|---|---|
| Total Horsepower | 155 | HP | (100 kW generator) |
| Total Heat Input Capacity | 1.39 | MMBtu/hr | (Calculated using vender supplied maximum fuel consumption of 1389 cfh and nominal fuel rating of 1000 Btu/cf) |
| Limited Operating Hours | 500 | hr/year | Proposed limited number of hours of operation. |

| Pollutant | Emission Factor[1] (lb/MMBtu) | Potential Emission Rate (lbs/hr) | Limited Operation Potential Emission Rate (tons/year) |
|---|---|---|---|
| Particulate Matter (PM/$PM_{10}$) | 9.99E-03 | 0.01 | 3.47E-03 |
| Particulate Matter ($PM_{2.5}$)[2] | 9.66E-03 | 0.01 | 3.35E-03 |
| Sulfur Dioxide ($SO_2$) | 5.88E-04 | 8.17E-04 | 2.04E-04 |
| Nitrogen Oxides ($NO_x$) | 4.08 | 5.67 | 1.42 |
| Carbon Monoxide (CO) | 0.317 | 0.44 | 0.11 |
| Volatile Organic Compounds (VOC) | 0.118 | 0.16 | 0.04 |
| Greenhouse Gas Emissions (GHGs)[3],[4] | | | |
| Carbon Dioxide ($CO_2$), GWP = 1 | 110 | 152.79 | 38.20 |
| Methane ($CH_4$), GWP = 25 | 0.00220 | 0.003 | 7.66E-04 |
| Nitrous Oxide ($N_2O$), GWP = 298 | 0.000220 | 0.000 | 7.66E-05 |
| Total GHG as $CO_2e$ | | 152.95 | 38.24 |
| Individual Hazardous Air Pollutants (HAP) | | | |
| 1,1,2,2 - Tetrachloroethane | 4.00E-05 | 5.56E-05 | 1.39E-05 |
| 1,1,2 - Trichloroethane | 3.18E-05 | 4.42E-05 | 1.10E-05 |
| 1,3 - Butadiene | 2.67E-04 | 3.71E-04 | 9.27E-05 |
| 1,3 - Dichloropropene | 2.64E-05 | 3.67E-05 | 9.17E-06 |
| 2 - Methylnaphthalene | 3.32E-05 | 4.61E-05 | 1.15E-05 |
| 2,2,4 - Trimethylpentane | 2.50E-04 | 3.47E-04 | 8.68E-05 |
| Acenaphthene | 1.25E-06 | 1.74E-06 | 4.34E-07 |
| Acenaphthylene | 5.53E-06 | 7.68E-06 | 1.92E-06 |
| Acetaldehyde | 8.36E-03 | 1.16E-02 | 2.90E-03 |
| Acrolein | 5.14E-03 | 7.14E-03 | 1.78E-03 |
| Benzene | 4.40E-04 | 6.11E-04 | 1.53E-04 |
| Benzo(b)fluoranthene | 1.66E-07 | 2.31E-07 | 5.76E-08 |
| Benzo(e)pyrene | 4.15E-07 | 5.76E-07 | 1.44E-07 |
| Benzo(g,h,i)perylene | 4.14E-07 | 5.75E-07 | 1.44E-07 |
| Biphenyl | 2.12E-04 | 2.94E-04 | 7.36E-05 |
| Carbon Tetrachloride | 3.67E-05 | 5.10E-05 | 1.27E-05 |
| Chlorobenzene | 3.04E-05 | 4.22E-05 | 1.06E-05 |
| Chloroform | 2.85E-05 | 3.96E-05 | 9.90E-06 |
| Chrysene | 6.93E-07 | 9.63E-07 | 2.41E-07 |
| Ethylbenzene | 3.97E-05 | 5.51E-05 | 1.38E-05 |
| Ethylene Dibromide | 4.43E-05 | 6.15E-05 | 1.54E-05 |
| Fluoranthene | 1.11E-06 | 1.54E-06 | 3.85E-07 |
| Fluorene | 5.67E-06 | 7.88E-06 | 1.97E-06 |
| Formaldehyde | 5.28E-02 | 7.33E-02 | 1.83E-02 |
| Methanol | 2.50E-03 | 3.47E-03 | 8.68E-04 |
| Methylene Chloride | 2.00E-05 | 2.78E-05 | 6.95E-06 |
| Hexane | 1.11E-03 | 1.54E-03 | 3.85E-04 |
| Naphthalene | 7.44E-05 | 1.03E-04 | 2.58E-05 |
| Polycyclic Aromatic Hydrocarbons (PAH) | 2.69E-05 | 3.74E-05 | 9.34E-06 |
| Phenanthrene | 1.04E-05 | 1.44E-05 | 3.61E-06 |
| Phenol | 2.40E-05 | 3.33E-05 | 8.33E-06 |
| Pyrene | 1.36E-06 | 1.89E-06 | 4.72E-07 |
| Styrene | 2.36E-05 | 3.28E-05 | 8.20E-06 |
| Tetrachloroethane | 2.48E-06 | 3.44E-06 | 8.61E-07 |
| Toluene | 4.09E-04 | 5.68E-04 | 1.42E-04 |
| Vinyl Chloride | 1.49E-05 | 2.07E-05 | 5.17E-06 |
| Xylene | 1.84E-04 | 2.56E-04 | 6.39E-05 |
| Total HAPs | -- | 0.1002 | 0.0251 |

[1]Emission Factors are from AP-42 Tables 3.2-2 (7/00)

[2]Considering $PM_{2.5}$ fraction of total PM as 0.967 from CEIDARS $PM_{2.5}$ emission factor scaling table

[3]Emission Factors for CH4 and N2O, from 40 CFR 98 Table C-2

[4]The Global Warming Potentials (GWP) are from 40 CFR Part 98 Table A-1 to Subpart A.
Conversion Factor: Heat Capacity of Natural Gas is 1,000 Btu/cf (Vender Supplied Data Sheet)

## Building Heaters

**Big Ox Energy - Siouxland**
**Emission Point ID#: EP09, EP10, and EP11**

### Make-Up Air Unit Combustion Emissions

Natural Gas Combustion Emissions from Building Make-up Air Units (Two (2) 2.25 MMBtu/hr and One (1) 1.505 MMBtu/hr Units)

| | | | | |
|---|---|---|---|---|
| Total Heat Input Capacity | 6.005 | MMBtu/hr = | 52,604 | MMBtu/yr |
| Heat Content of Natural Gas (HHV)<br>AP-42, Table 1.4-1, Footnote a | 1,020 | Btu/scf | | |
| Potential Natural Gas Throughput<br>Total | 0.006 | MMscf/hr = | 51.57 | MMscf/yr |

| Pollutant | Emission Factor[1] | Potential Emission Rate (lbs/hr) | Potential Emission Rate (tons/year) |
|---|---|---|---|
| | (lb/MMscf) | Total | Total |
| Particulate Matter ($PM/PM_{10}$) | 7.6 | 0.045 | 0.20 |
| Particulate Matter ($PM_{2.5}$) | 7.6 | 0.045 | 0.20 |
| Sulfur Dioxide ($SO_2$) | 0.6 | 0.004 | 0.02 |
| Nitrogen Oxides ($NO_x$) | 100 | 0.589 | 2.58 |
| Carbon Monoxide (CO) | 84 | 0.495 | 2.17 |
| Volatile Organic Compounds (VOC) | 5.5 | 0.032 | 0.14 |
| Green House Gas Emissions (GHGs)[2] | | | |
| Carbon Dioxide ($CO_2$), GWP = 1 | 120,000 | 706.47 | 3,094.34 |
| Methane ($CH_4$), GWP = 25 | 2.3 | 0.01 | 0.06 |
| Nitrous Oxide ($N_2O$), GWP = 298 | 2.2 | 0.01 | 0.06 |
| Total GHG as $CO_2e$ | | 710.67 | 3,112.73 |
| Individual Hazardous Air Pollutants (HAP) | | | |
| Benzene | 0.0021 | 1.24E-05 | 5.42E-05 |
| Dichlorobenzene | 0.0012 | 7.06E-06 | 3.09E-05 |
| Hexane | 1.8 | 1.06E-02 | 4.64E-02 |
| Lead Compounds | 0.0005 | 2.94E-06 | 1.29E-05 |
| Naphthalene | 0.00061 | 3.59E-06 | 1.57E-05 |
| Polycyclic Organic Matter (POM) | 0.0000882 | 5.19E-07 | 2.27E-06 |
| Toluene | 0.0034 | 2.00E-05 | 8.77E-05 |
| Arsenic Compounds (ASC) | 0.0002 | 1.18E-06 | 5.16E-06 |
| Beryllium Compounds (BEC) | 0.000012 | 7.06E-08 | 3.09E-07 |
| Cadmium Compounds (CDC) | 0.0011 | 6.48E-06 | 2.84E-05 |
| Chromium Compounds (CRC) | 0.0014 | 8.24E-06 | 3.61E-05 |
| Cobalt Compounds (COC) | 0.000084 | 4.95E-07 | 2.17E-06 |
| Manganese Compounds (MNC) | 0.00038 | 2.24E-06 | 9.80E-06 |
| Mercury Compounds (HGC) | 0.00026 | 1.53E-06 | 6.70E-06 |
| Nickel Compounds (NIC) | 0.0021 | 1.24E-05 | 5.42E-05 |
| Selenium Compounds (SEC) | 0.000024 | 1.41E-07 | 6.19E-07 |
| Total HAPs | | 0.011 | 0.047 |

[1]Emission Factors from AP-42 Tables 1.4-1, 1.4-2, 1.4-3 and 1.4-4 (7/98)

[2]The Global Warming Potentials (GWP) are from 40 CFR Part 98 Table A-1 to Subpart A.

# Haul Road Emissions

**Big Ox Energy - Siouxland**
**Emission Point ID#: Trucks**

**Paved roads {AP-42 Chapter 13.2.1 (1/11)}**

*Equation (2):* $$E = k \times (sL)^{0.91} \times (W)^{1.02} \times \left(1 - \frac{P}{4 \times 365}\right)$$

| | *k (lb/VMT)* |
|---|---|
| PM | 0.011 |
| $PM_{10}$ | 0.0022 |
| $PM_{2.5}$ | 0.00054 |

**Unpaved roads {AP-42 Chapter 13.2.2 (11/06)}**

*Equation (1a):* *(Modified)* $$E = k \times \left(\frac{sC}{12}\right)^{a} \times \left(\frac{W}{3}\right)^{b} \times \left(\frac{365 - P}{365}\right) \times \left(\frac{S}{30}\right)^{d} \times (1 - CE)$$

| | *k (lb/VMT)* | *a* | *b* | *d* |
|---|---|---|---|---|
| PM | 4.9 | 0.7 | 0.45 | 0.3 |
| $PM_{10}$ | 1.5 | 0.9 | 0.45 | 0.5 |
| $PM_{2.5}$ | 0.15 | 0.9 | 0.45 | 0.5 |

## Haul Road / Traffic Parameters

| Activity / Road Description | Road Type / Silt Value | | Roundtrip Length (feet) | | Truck Weight (tons) | | | Ave. Speed (mph) | Unrestricted Maximum Throughput (units/yr) | Ave. Truck Capacity (units/truck) | | Annual VMT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | empty | full | empty | full | Ave. | | | | | |
| High Strength Waste | p | 3.00 | 943 | 943 | 12.5 | 40 | 26.3 | 30 | 2,190 | 1 | truck | 782 |
| Dewatered Cake | p | 3.00 | 1,604 | 1,116 | 12.5 | 40 | 23.8 | 30 | 2,190 | 1 | truck | 1,128 |
| Packaged Waste | p | 3.00 | 943 | 943 | 12.5 | 40 | 26.3 | 30 | 2,190 | 1 | truck | 782 |
| Waste Packaging | p | 3.00 | 943 | 943 | 12.5 | 40 | 26.3 | 30 | 2,190 | 1 | truck | 782 |
| Sulfur Solids from Boigas Cleanup | p | 3.00 | 943 | 943 | 12.5 | 40 | 26.3 | 30 | 2,190 | 1 | truck | 782 |
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## Emission Calculations

| | Emission Factors (lb/VMT) | | | Potential Emissions (tons/yr) | | |
|---|---|---|---|---|---|---|
| | PM | $PM_{10}$ | $PM_{2.5}$ | PM | $PM_{10}$ | $PM_{2.5}$ |
| High Strength Waste | 0.79 | 0.16 | 0.04 | 0.31 | 0.06 | 0.02 |
| Dewatered Cake | 0.71 | 0.14 | 0.03 | 0.40 | 0.08 | 0.02 |
| Packaged Waste | 0.79 | 0.16 | 0.04 | 0.31 | 0.06 | 0.02 |
| Waste Packaging | 0.79 | 0.16 | 0.04 | 0.31 | 0.06 | 0.02 |
| Sulfur Solids from Boigas Cleanup | 0.79 | 0.16 | 0.04 | 0.31 | 0.06 | 0.02 |
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| **Total Annual Emissions:** | | | | **0.71** | **0.14** | **0.03** |

### Description of Constants/Variables

*E* : haul road emissions (lb/VMT)
*k, d* : dimensionless constants from Draft AP-42 Chapter 13.IV (paved)
*k, a, b, c, d* : dimensionless constants from AP-42 Tables 13.2.1-1 & 13.2.2-2 (unpaved)
*sL* : silt loading ($g/m^2$) of paved road surface
*sC* : silt content (%) of unpaved road surface
*W* : average vehicle weight (tons)
*P* : days/yr with at least 0.01" of precipitation
*P* = 90 default = 90
*S* : mean vehicle speed on road (mph)
default = 30, minimum =15
*CE* : unpaved road, dust control efficiency
*CE* = 0 % default = 0%
VMT: vehicle miles traveled

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# Air Quality Construction Permit Application
# Form 4.0: Applicable Requirements

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921

## Section 4.1: NSPS Applicable Requirements

**IMPORTANT: Do NOT use pencil to fill out this application. Please type responses or use black ink.**

For each applicable New Source Performance Standard (NSPS) that a unit(s) located at your facility is/will be subject to, identify the applicable requirement (ex. NSPS, Subpart Dc), the requirement citation (e.g. T129, Chapter 18, Section 001.52 and/or 40 CFR 60.40c), and the unit(s) subject to the applicable requirement (e.g. EU31-Boiler #3). Only units being addressed in this application need to be included on this page. For information on NSPS, visit http://www.epa.gov/region07/programs/artd/air/nsps/nsps_standard_contacts.htm or contact NDEQ NSPS Coordinator at (402) 471-2189.

| Applicable Requirement | Requirement Citation | Units Subject to Applicable Requirement (Emission Unit ID# and Description) |
|---|---|---|
| NSPS, Subpart JJJJ | T129, Chapter 18, Section 001.82 and 40 CFR 60.4230 | EU08 – Emergency Generator Engine |
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# Air Quality Construction Permit Application
# Form 4.0: Applicable Requirements

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921

## Section 4.1: NSPS Applicable Requirements (continued)

**IMPORTANT: Do NOT use pencil to fill out this application. Please type responses or use black ink.**

For each New Source Performance Standard (NSPS) that may appear to apply to a unit(s) located at your facility but actually does not apply, identify the applicable requirement (e.g. NSPS, Subpart IIII), the requirement citation (ex. T129, Chapter 18, Section 001.76 and/or 40 CFR 60.4200), and the unit(s) that appear to apply to the subpart (ex. EU20-Emergency Generator) and the reason why the subpart does not apply (e.g. displacement is greater than 30 liters per cylinder). Only units being addressed in this application need to be included on this page.

| Applicable Requirement | Requirement Citation | Unit ID# and Description | Reason(s) Why Requirement Does Not Apply |
|---|---|---|---|
| NSPS, Subpart IIII | T129, Chapter 18, Section 001.76 and 40 CFR 60.4200 | EU08 – Emergency Generator Engine | The generator is not a compression ignition engine |
| NSPS, Subpart OOOO | T129, Chapter 18, Section 001.89 and 40 CFR 60.5360 | Entire Facility | The facility is not a natural gas production, transmission, and distribution site. |
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# Air Quality Construction Permit Application
# Form 4.0: Applicable Requirements

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921

## Section 4.2: NESHAP Applicable Requirements

**IMPORTANT: Do NOT use pencil to fill out this application. Please type responses or use black ink.**

For each applicable National Emission Standard for Hazardous Air Pollutants (NESHAP) that a unit(s) or process located at your facility is/will be subject to, identify the applicable requirement (e.g. NESHAP, Subpart ZZZZ), the requirement citation (e.g. T129, Chapter 28, Section 001.88 and/or 40 CFR 63.6580), and the unit(s), process, or emission point(s) that is subject to the applicable requirement (e.g. EU20, Emergency Generator or EP-32, Fermentation Scrubber Vent). If no units or processes at your facility are subject to any NESHAP requirements (including any area source NESHAPs), this section does not need to be completed and/or submitted. For information about NESHAPs, view http://www.epa.gov/ttn/atw/mactfnlalph.html or contact NDEQ MACT Coordinator at 402-471-2189 for assistance.

NOTE: Completing this section does not fulfill the initial notification requirements under the NESHAP general provisions, please contact the NDEQ MACT Coordinator for initial notification requirements and forms.

| Applicable Requirement | Requirement Citation | Units Subject to Applicable Requirement (Emission Unit ID# and Description) |
|---|---|---|
| NESHAP, Subpart ZZZZ | T129, Chapter 28, Seciton 001.88 and 40 CFR 63.6580 | EU08 – Emergency Generator Engine |
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# Air Quality Construction Permit Application
# Form 4.0: Applicable Requirements

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921

## Section 4.2: NESHAP Applicable Requirements (continued)

**IMPORTANT: Do NOT use pencil to fill out this application. Please type responses or use black ink.**

For each National Emission Standard for Hazardous Air Pollutants (NESHAP) that may appear to apply to a unit(s) or process located at your facility but actually does not apply, identify the applicable requirement (e.g. NESHAP, Subpart ZZZZ), the requirement citation (e.g. T129, Chapter 28, Section 001.88 and/or 40 CFR 63.), and the unit(s), process, or emission point(s) that is subject to the applicable requirement (e.g. EU20, Emergency Generator or EP-32, Fermentation Scrubber Vent), and the reason why the subpart does not apply.

| Applicable Requirement | Requirement Citation | Unit ID# and Description | Reason(s) Why Requirement Does Not Apply |
|---|---|---|---|
| NESHAP, Subpart VVV | T129, Chapter 28, Seciton 001.50 and 40 CFR 63.1580 | Entire Facility | The facility is not POTW or an industrial POTW as defined by the NESHAP. The facility is also not a major source of HAPs so is not covered as a non-industrial POTW treatment plant. |
| NESHAP Subpart HH | T129, Chapter 28, Section 001.30 and 40 CFR 63.760 | Entire Facility | The facility does not have any triethylene glycol dehydration units present. |
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# Air Quality Permitting Application
# Form 6.0: Emission Point Information

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921 **Emission Point Identification#:** EP01 through EP05

## Section 6.1: External Combustion Unit

**IMPORTANT: READ THE INSTRUCTIONS ACCOMPANYING THIS SECTION BEFORE COMPLETING.**
Do **NOT** use pencil to fill out this application. Please type responses or print using black ink.

### General Information

| | |
|---|---|
| 1) Unit ID#: EU01 through EU05 | 2) Installation Date: ☒ New |
| 3) Unit Type: ☒ Boiler ☐ Dryer ☐ Other _____ | 4) Maximum Rated Capacity: 0.8 MMBtu/hr each |
| 5) Gross Power Output: MW ☒ N/A | Net Power Output: MW ☒ N/A |

### 6) Stack Information ☐ N/A

| Height | Top Inside Diameter | Stack Discharge | Exit Velocity of Gas | Exit Temperature of Gas |
|---|---|---|---|---|
| 27.05 ft | 0.5 ft | ☐ Horizontal<br>☒ Vertical<br>☐ Vertical with Rain | 0.0897 m/s | 338.71 K |

### 7) Fuel Information

| Type/Grade of Fuel Combusted | Maximum Fuel Capacity (include units) | Heat Content (include units) | Fuel Specifications | Operating Limitation (include units) |
|---|---|---|---|---|
| Natural Gas | 0.8 MMBtu/hr each | 1,020 Btu/scf | % Sulfur:<br>% Ash: | ☒ N/A |
| Type/Grade of Fuel Combusted | Maximum Fuel Capacity (include units) | Heat Content (include units) | Fuel Specifications | Operating Limitation (include units) |
| | | | % Sulfur:<br>% Ash: | ☐ N/A |
| Type/Grade of Fuel Combusted | Maximum Fuel Capacity (include units) | Heat Content (include units) | Fuel Specifications | Operating Limitation (include units) |
| | | | % Sulfur:<br>% Ash: | ☐ N/A |

If the external combustion unit combusts more than three types of fuel, attach additional pages so that all fuel types are listed.

### 8) New Source Performance Standard Applicability

This external combustion unit is subject to:
If unknown contact the department for additional information

☐ NSPS, Subpart D ☐ NSPS, Subpart Da ☐ NSPS, Subpart Db ☐ NSPS Subpart Dc ☐ Other _____ ☒ None

# Air Quality Permitting Application
# Form 6.0: Emission Point Information

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921 **Emission Point Identification#:** EP01 through EP05

## Section 6.1: External Combustion Unit (continued)

### 9) Air Pollution Control Equipment

Is there an air pollution control device(s) associated with this unit? ☐ YES ☒ NO

| Control Equipment ID# | Type of Control Equipment | Pollutant(s) Controlled | % Control Efficiency | Installation Date |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

| Control Equipment ID# | Type of Control Equipment | Pollutant(s) Controlled | % Control Efficiency | Installation Date |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

If there are two or more pieces of control equipment identify the correct configuration: ☐ Series ☐ Parallel ☐ Other: _____

**10) Potential to Emit Calculations Attached?** ☒ **YES**

**11) Additional Information Attached?** ☐ **YES** ☒ **NO**

**Complete the following ONLY if completing this Section as Part of an Operating Permit Application**

### Operating Information

12) Indicate the quantity of each fuel type that has been combusted in the external combustion unit:

| Fuel Type | Maximum Amount Combusted in the Previous Five Years | | Amount Last Year | |
|---|---|---|---|---|
| | Number | Units | Number | Units |
| | | | | |
| | | | | |
| | | | | |

13) If this is an electric generating unit, provide the gross and net power generation from this unit for the past five years:

| | | | | | |
|---|---|---|---|---|---|
| Year | | | | | |
| Gross MW Produced | | | | | |
| Net MW Produced | | | | | |

**14) Actual Emission Calculations Attached?** ☐ **YES**

**15) Additional Information Attached?** ☐ **YES** ☐ **NO**

# Air Quality Permitting Application
# Form 6.0: Emission Point Information

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921 **Emission Point Identification#:** EP09, EP10

## Section 6.1: External Combustion Unit

**IMPORTANT: READ THE INSTRUCTIONS ACCOMPANYING THIS SECTION BEFORE COMPLETING.**
Do **NOT** use pencil to fill out this application. Please type responses or print using black ink.

### General Information

| | |
|---|---|
| 1) Unit ID#: EU09, EU10 | 2) Installation Date: ☒ New |
| 3) Unit Type: ☐ Boiler ☐ Dryer ☒ Other Makeup Air Unit | 4) Maximum Rated Capacity: 2.25 MMBtu/hr each |
| 5) Gross Power Output: MW ☒ N/A | Net Power Output: MW ☒ N/A |

### 6) Stack Information ☐ N/A

| Height | Top Inside Diameter | Stack Discharge | Exit Velocity of Gas | Exit Temperature of Gas |
|---|---|---|---|---|
| 29.75 ft | To Be Determined ft | ☐ Horizontal<br>☐ Vertical<br>☐ Vertical with Rain | To Be Determined m/s | To Be Determined K |

### 7) Fuel Information

| Type/Grade of Fuel Combusted | Maximum Fuel Capacity (include units) | Heat Content (include units) | Fuel Specifications | Operating Limitation (include units) |
|---|---|---|---|---|
| Natural Gas | 2.25 MMBtu/hr each | 1,020 Btu/scf | % Sulfur:<br>% Ash: | ☒ N/A |
| Type/Grade of Fuel Combusted | Maximum Fuel Capacity (include units) | Heat Content (include units) | Fuel Specifications | Operating Limitation (include units) |
| | | | % Sulfur:<br>% Ash: | ☐ N/A |
| Type/Grade of Fuel Combusted | Maximum Fuel Capacity (include units) | Heat Content (include units) | Fuel Specifications | Operating Limitation (include units) |
| | | | % Sulfur:<br>% Ash: | ☐ N/A |

If the external combustion unit combusts more than three types of fuel, attach additional pages so that all fuel types are listed.

### 8) New Source Performance Standard Applicability

This external combustion unit is subject to:
If unknown contact the department for additional information

☐ NSPS, Subpart D ☐ NSPS, Subpart Da ☐ NSPS, Subpart Db ☐ NSPS Subpart Dc ☐ Other _____ ☒ None

# Air Quality Permitting Application
# Form 6.0: Emission Point Information

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921 **Emission Point Identification#:** EP09, EP10

## Section 6.1: External Combustion Unit (continued)

### 9) Air Pollution Control Equipment

Is there an air pollution control device(s) associated with this unit? ☐ YES ☒ NO

| Control Equipment ID# | Type of Control Equipment | Pollutant(s) Controlled | % Control Efficiency | Installation Date |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| Control Equipment ID# | Type of Control Equipment | Pollutant(s) Controlled | % Control Efficiency | Installation Date |
| | | | | |
| | | | | |
| | | | | |

If there are two or more pieces of control equipment identify the correct configuration: ☐ Series ☐ Parallel ☐ Other: _____

**10) Potential to Emit Calculations Attached?** ☒ **YES**

**11) Additional Information Attached?** ☐ **YES** ☒ **NO**

**Complete the following ONLY if completing this Section as Part of an Operating Permit Application**

### Operating Information

12) Indicate the quantity of each fuel type that has been combusted in the external combustion unit:

| Fuel Type | Maximum Amount Combusted in the Previous Five Years | | Amount Last Year | |
|---|---|---|---|---|
| | Number | Units | Number | Units |
| | | | | |
| | | | | |
| | | | | |

13) If this is an electric generating unit, provide the gross and net power generation from this unit for the past five years:

| | | | | | |
|---|---|---|---|---|---|
| Year | | | | | |
| Gross MW Produced | | | | | |
| Net MW Produced | | | | | |

**14) Actual Emission Calculations Attached?** ☐ **YES**

**15) Additional Information Attached?** ☐ **YES** ☐ **NO**

# Air Quality Permitting Application
# Form 6.0: Emission Point Information

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921 **Emission Point Identification#:** EP11

## Section 6.1: External Combustion Unit

**IMPORTANT: READ THE INSTRUCTIONS ACCOMPANYING THIS SECTION BEFORE COMPLETING.**
Do **NOT** use pencil to fill out this application. Please type responses or print using black ink.

### General Information

| | |
|---|---|
| 1) Unit ID#: EU11 | 2) Installation Date: ☒ New |
| 3) Unit Type: ☐ Boiler ☐ Dryer ☒ Other Makeup Air Unit | 4) Maximum Rated Capacity: 1.505 MMBtu/hr |
| 5) Gross Power Output: MW ☒ N/A | Net Power Output: MW ☒ N/A |

### 6) Stack Information ☐ N/A

| Height | Top Inside Diameter | Stack Discharge | Exit Velocity of Gas | Exit Temperature of Gas |
|---|---|---|---|---|
| 41.75 ft | To Be Determined ft | ☐ Horizontal<br>☐ Vertical<br>☐ Vertical with Rain | To Be Determined m/s | To Be Determined K |

### 7) Fuel Information

| Type/Grade of Fuel Combusted | Maximum Fuel Capacity (include units) | Heat Content (include units) | Fuel Specifications | Operating Limitation (include units) |
|---|---|---|---|---|
| Natural Gas | 1.505 MMBtu/hr each | 1,020 Btu/scf | % Sulfur:<br>% Ash: | ☒ N/A |
| Type/Grade of Fuel Combusted | Maximum Fuel Capacity (include units) | Heat Content (include units) | Fuel Specifications | Operating Limitation (include units) |
| | | | % Sulfur:<br>% Ash: | ☐ N/A |
| Type/Grade of Fuel Combusted | Maximum Fuel Capacity (include units) | Heat Content (include units) | Fuel Specifications | Operating Limitation (include units) |
| | | | % Sulfur:<br>% Ash: | ☐ N/A |

If the external combustion unit combusts more than three types of fuel, attach additional pages so that all fuel types are listed.

### 8) New Source Performance Standard Applicability

This external combustion unit is subject to:
If unknown contact the department for additional information

☐ NSPS, Subpart D ☐ NSPS, Subpart Da ☐ NSPS, Subpart Db ☐ NSPS Subpart Dc ☐ Other _____ ☒ None

# Air Quality Permitting Application
# Form 6.0: Emission Point Information

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921 **Emission Point Identification#:** EP11

## Section 6.1: External Combustion Unit (continued)

### 9) Air Pollution Control Equipment

Is there an air pollution control device(s) associated with this unit? ☐ YES ☒ NO

| Control Equipment ID# | Type of Control Equipment | Pollutant(s) Controlled | % Control Efficiency | Installation Date |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| Control Equipment ID# | Type of Control Equipment | Pollutant(s) Controlled | % Control Efficiency | Installation Date |
| | | | | |
| | | | | |
| | | | | |

If there are two or more pieces of control equipment identify the correct configuration: ☐ Series ☐ Parallel ☐ Other: _____

**10) Potential to Emit Calculations Attached?** ☒ **YES**

**11) Additional Information Attached?** ☐ **YES** ☒ **NO**

**Complete the following ONLY if completing this Section as Part of an Operating Permit Application**

### Operating Information

12) Indicate the quantity of each fuel type that has been combusted in the external combustion unit:

| Fuel Type | Maximum Amount Combusted in the Previous Five Years | | Amount Last Year | |
|---|---|---|---|---|
| | Number | Units | Number | Units |
| | | | | |
| | | | | |
| | | | | |

13) If this is an electric generating unit, provide the gross and net power generation from this unit for the past five years:

| | | | | | |
|---|---|---|---|---|---|
| Year | | | | | |
| Gross MW Produced | | | | | |
| Net MW Produced | | | | | |

**14) Actual Emission Calculations Attached?** ☐ **YES**

**15) Additional Information Attached?** ☐ **YES** ☐ **NO**

# Air Quality Permitting Application
# Form 6.0: Emission Point Information

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921 **Emission Point Identification#:** EP08

## Section 6.2.1: Internal Combustion Unit

**IMPORTANT: READ THE INSTRUCTIONS ACCOMPANYING THIS SECTION BEFORE COMPLETING.**
Do **NOT** use pencil to fill out this application. Please type responses or print using black ink.

### General Information

| | |
|---|---|
| 1) Unit ID#: EU08 | 2) Installation Date: ☒ New |
| 3) Model Year: | 4) Manufacture Date |

5) Unit Type: ☐ Stationary Gas Turbine ☒ Natural Gas-Fired Reciprocating Engine ☐ Engine ☐ Other _____

6) Maximum Rated Capacity: 155 ☐ MMBtu/hr ☒ HP ☐ kW

7) Maximum Displacement 0.7125 Liters/Cylinder Total Number of cylinders 8

8) Engine Purpose: Emergency Generator

9) Engine Classification: ☒ Stationary (Complete this form) ☐ Non-road (Complete Form 6.2.2 instead) ☐ Other _____

### 10) Stack Information ☐ N/A

| Height | Top Inside Diameter | Stack Discharge | Exit Velocity of Gas | Exit Temperature of Gas |
|---|---|---|---|---|
| 5.57 ft | 0.25 ft | ☐ Horizontal<br>☒ Vertical<br>☐ Vertical with Rain | 90.66 m/s | 950 K |

### 11) Fuel Information

| Type/Grade of Fuel Combusted | Maximum Fuel Capacity (include units) | Heat Content (include units) | Fuel Specifications | Operating Limitation (include units) |
|---|---|---|---|---|
| Natural Gas | 1389 cfh | 1000 Btu/cf | % Sulfur:<br>% Ash: | 500 hr/yr ☒ N/A |
| Type/Grade of Fuel Combusted | Maximum Fuel Capacity (include units) | Heat Content (include units) | Fuel Specifications | Operating Limitation (include units) |
| | | | % Sulfur:<br>% Ash: | ☐ N/A |
| Type/Grade of Fuel Combusted | Maximum Fuel Capacity (include units) | Heat Content (include units) | Fuel Specifications | Operating Limitation (include units) |
| | | | % Sulfur:<br>% Ash: | ☐ N/A |

If the internal combustion unit combusts more than three types of fuel, attach additional pages so that all fuel types are listed.

### 12) NSPS/NESHAP Applicability

This internal combustion unit is subject to:
If unknown contact the Department for further instructions.

☐ NSPS, Subpart GG
☐ NSPS, Subpart KKKK
☐ NSPS, Subpart IIII
☒ NSPS, Subpart JJJJ
☒ NESHAP, Subpart ZZZZ
☐ Other _____
☐ None

# Air Quality Permitting Application
# Form 6.0: Emission Point Information

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921 **Emission Point Identification#:** EP08

## Section 6.2.1: Internal Combustion Unit (continued)

### 13) Air Pollution Control Equipment

Is there an air pollution control device(s) associated with this unit? ☐ YES ☒ NO

| Control Equipment ID# | Type of Control Equipment | Pollutant(s) Controlled | % Control Efficiency | Installation Date |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| Control Equipment ID# | Type of Control Equipment | Pollutant(s) Controlled | % Control Efficiency | Installation Date |
| | | | | |
| | | | | |
| | | | | |

If there are two or more pieces of control equipment, identify the correct configuration: ☐ Series ☐ Parallel ☐ Other: _____

**14) Potential to Emit Calculations Attached?** ☒ **YES**

**15) Additional Information Attached?** ☐ **YES** ☒ **NO**

**Include the following ONLY if completing Section 6.2 for an Operating Permit Application**

### Operating Information

16) Indicate the quantity of each fuel type that has been combusted in the internal combustion unit:

| Fuel Type | Maximum Amount Combusted in the Previous Five Years | | Amount Last Year | |
|---|---|---|---|---|
| | Number | Units | Number | Units |
| | | | | |
| | | | | |
| | | | | |

17) Provide the operating hours <u>of this unit</u> for the past five years (past year if new source):

| Year | | | | | |
|---|---|---|---|---|---|
| Hours Operated | | | | | |

**18) Actual Emission Calculations Attached?** ☐ **YES**

**19) Additional Information Attached?** ☐ **YES** ☐ **NO**

# Air Quality Permitting Application
# Form 6.0: Emission Points

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921 **Emission Point Identification#:** EP07

## Section 6.4: Uncontrolled Emission Point

**IMPORTANT: READ THE INSTRUCTIONS ACCOMPANYING THIS SECTION BEFORE COMPLETING.**
Do **NOT** use pencil to fill out this application. Please type responses or print using black ink.

### 1) Unit Information

List all of the emission units that contribute to the emissions from the Emission Point ID# listed above:

| Unit ID# | Unit Type[1] | Unit Name | Maximum Capacity (include units) | Installation Date |
|---|---|---|---|---|
| **EU07** | **Gas Cleanup Skid** | **Tail Gas Exhaust** | **35,760 scf/hr** | ☒ New |
| | | | | ☐ New |
| | | | | ☐ New |
| | | | | ☐ New |
| | | | | ☐ New |
| | | | | ☐ New |

If more than six units' emissions are emitted through this emission point, attach additional pages so that all emission units are accounted for.

[1]Unit Types could include: Conveyor, Elevator, Hammermill, Silo, Bin, Crusher, Fermenter, etc.

### 2) Stack Information ☐ N/A

| Height | Top Inside Diameter | Stack Discharge | Exit Velocity of Gas | Exit Temperature of Gas |
|---|---|---|---|---|
| 17.1 ft | 0.5 ft | ☐ Horizontal<br>☒ Vertical<br>☐ Vertical with Rain | 15.42 m/s | 350 K |

### 3) Emission Unit Fuel Information

Will/Do any of the units identified above combust fuel (i.e. boiler, dryer, etc)? ☒ No ☐ Yes

If Yes, Complete the following information for each emission unit that combusts fuel:

| Unit ID#: | Maximum Rated Capacity of Unit: MMBtu/hr |
|---|---|
| Unit Name/Description: | |

Complete the following information for each type of fuel combusted in the emission unit:

| Type/Grade of Fuel Combusted | Maximum Fuel Capacity (include units) | Heat Content (include units) | Fuel Specifications | Operating Limitation (include units) |
|---|---|---|---|---|
| | | | % Sulfur: | ☐ N/A |
| | | | % Ash: | |

**OP Application ONLY**: Provide the actual fuel usage for this fuel type for the past five years (past year if new source):

| | | | | | |
|---|---|---|---|---|---|
| Year | | | | | |
| Throughput (Units: _____) | | | | | |

If the emissions unit combusts more than one type of fuel, attach additional pages so that all fuel types are listed.

# Air Quality Permitting Application
# Form 6.0: Emission Points

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921 **Emission Point Identification#:** EP07

## Section 6.4: Uncontrolled Emission Point (continued)

**3) Emission Unit Fuel Information (continued)**

| Unit ID#: | Maximum Rated Capacity of Unit: MMBtu/hr |
|---|---|
| Unit Name/Description: | |

Complete the following information for each type of fuel combusted in the emission unit:

| Type/Grade of Fuel Combusted | Maximum Fuel Capacity (include units) | Heat Content (include units) | Fuel Specifications | Operating Limitation (include units) |
|---|---|---|---|---|
| | | | % Sulfur: | ☐ N/A |
| | | | % Ash: | |

**OP Application ONLY**: Provide the actual fuel usage for this fuel type for the past five years (past year if new source):

| | | | | | |
|---|---|---|---|---|---|
| Year | | | | | |
| Throughput (Units: _____) | | | | | |

If the emissions unit combusts more than one type of fuel, attach additional pages so that all fuel types are listed.

If more than two of the emission units whose emissions contribute to the emission point identified combust fuel, attach additional pages so that all combustion units and fuel types are listed.

**4) Potential to Emit Calculations Attached?** ☒ **YES**

**5) OP Application ONLY: Actual Emission Calculations Attached?** ☐ **YES**

**6) Additional Information Attached?** ☐ **YES** ☒ **NO**

# Air Quality Permitting Application
# Form 6.0: Emission Point Information

**FACILITY NAME:** Big Ox Energy – Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921 **Emission Point Identification #:** Trucks

## Section 6.9: Haul Roads

**IMPORTANT: READ THE INSTRUCTIONS ACCOMPANYING THIS SECTION BEFORE COMPLETING.**
Do **NOT** use pencil to fill out this application. Please type responses or print using black ink.

**1) Is the NDEQ haul road spreadsheet attached as a substitute for items (2) through (8) below?**
☒ Yes, attach spreadsheet and skip to item (9) below ☐ No, fill out table below

**Haul Road / Traffic Parameters**

| (2) Activity / Road Description | (3) Road Type / Silt Value | | (4) Roundtrip Length (ft) | | (5) Truck Weight (tons) | | (6) Ave. Speed (mph) | (7) Annual Throughput (units/yr) | (8) Ave. Truck Capacity (units/truck) |
|---|---|---|---|---|---|---|---|---|---|
| | | | empty | full | empty | full | | | |
| See Attached | | | | | | | | ☐ | |
| | | | | | | | | ☐ | |
| | | | | | | | | ☐ | |
| | | | | | | | | ☐ | |
| | | | | | | | | ☐ | |
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| | | | | | | | | ☐ | |
| | | | | | | | | ☐ | |
| | | | | | | | | ☐ | |

**9) Silt loading/content values were obtained from (i.e. Testing, AP-42 defaults):** AP-42 defaults

**10) To assist in verification of haul road lengths and traffic speeds, please attach a plan view sketch indicating on-site haul road traffic patterns. Traffic sketch attached?** ☒ Yes

**11) Requested/Existing permit limits for annual throughput?** N/A

**12) Haul road emission calculations are attached or included with your application?** ☒ Yes

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# Air Quality Permitting Application
# Form 7.0: Control Equipment Information

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921 **Emission Point Identification#:** EP06

## Section 7.1: Combustion Flare

**IMPORTANT: READ THE INSTRUCTIONS ACCOMPANYING THIS SECTION BEFORE COMPLETING.**
Do **NOT** use pencil to fill out this application. Please type responses or print using black ink.

### General Information

| | |
|---|---|
| 1) Control Equipment ID#: CE06 | 2) Installation Date: ☒ New Unit |
| 3) Control Equipment Name/Description: Flare | |
| 4) Maximum Flare Rated Capacity: 102.0 MMBtu/hr | 5) Maximum Pilot Rated Capacity: 0.1 MMBtu/hr |
| 6) Operating Hours Limitation (include units): 500 hrs/yr | |

### 7) Unit Information

List all the emission units that are controlled by the combustion flare:

| Unit ID# | Unit Type[1] | Unit Name | Maximum Capacity (include units) | Installation Date | New Unit |
|---|---|---|---|---|---|
| **EU06** | **Anaerobic Digester** | **Anaerobic Digester** | **1,600 scf biogas/min** | | ☒ |
| | | | | | ☐ |
| | | | | | ☐ |
| | | | | | ☐ |
| | | | | | ☐ |
| | | | | | ☐ |

If more than six units' emissions are controlled by this combustion flare, attach additional pages so all emission units are accounted for.
If any units routed to this flare will combust their own fuel, complete Section 6.1 or Section 6.2 for each unit as appropriate.
[1]Unit Types could include: Conveyor, Elevator, Hammermill, Silo, Bin, Crusher, Reactor, Fermenter, Loadout Spout, etc.

### 8) Stack Information ☐ N/A

| Height | Top Inside Diameter | Stack Discharge | Flare Type | Exit Velocity of Gas | Exit Temperature of Gas |
|---|---|---|---|---|---|
| 17.1 act<br>39.9 eff ft | 1.4171 eff ft | ☐ Horizontal<br>☒ Vertical<br>☐ Vertical with Rain cap | ☐ Enclosed<br>☒ Open | 20 m/s | 1,273 K |

### 9) Flare Fuel Information

| Type/Grade of Fuel Combusted | Maximum Fuel Capacity (include units) | Heat Content (include units) | Fuel Specifications | Operating Limitation (include units) |
|---|---|---|---|---|
| Biogas | 65.31 MMBtu/hr | 680 Btu/scf | % Sulfur:<br>% Ash: | ☒ N/A |
| **Type/Grade of Fuel Combusted** | **Maximum Fuel Capacity (include units)** | **Heat Content (include units)** | **Fuel Specifications** | **Operating Limitation (include units)** |
| | | | % Sulfur:<br>% Ash: | ☐ N/A |

If the flare does/will combust more than two fuel types, attach additional pages so all fuels are described.

# Air Quality Permitting Application
# Form 7.0: Control Equipment Information

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921 **Emission Point Identification#:** EP06

## Section 7.1: Combustion Flare (continued)

**10) Pilot Fuel Information**

| Type/Grade of Fuel Combusted | Maximum Fuel Capacity (include units) | Heat Content (include units) | Fuel Specifications | Operating Limitation (include units) |
|---|---|---|---|---|
| Natural Gas | 0.1 MMBtu/hr | 1,020 Btu/scf | % Sulfur:<br>% Ash: | ☒ N/A |

If the pilot does/will combust more than one type of fuel, attach additional information so all fuels are provided.

**11) Control Information**

| Pollutant(s) Controlled | % Control Efficiency | Pollutant(s) Controlled | % Control Efficiency |
|---|---|---|---|
| H2S | 90% | | |
| Methane | 90% | | |
| | | | |

If additional pollutants are being controlled, attach additional information.

**12) Potential to Emit Calculations Attached?** ☒ **YES**

**13) Additional Information Attached?** ☐ **YES** ☒ **NO**

**Complete the following ONLY if completing this Section as Part of an Operating Permit Application**

**Actual Flare Information**

14) Indicate the quantity of each fuel type that has been combusted in the flare.

| Fuel Type | Maximum Amount Combusted in the Previous Five Years | | Amount Last Year | |
|---|---|---|---|---|
| | Number | Units | Number | Units |
| | | | | |
| | | | | |

15) Provide the operating hours <u>of this unit</u> for the past five years (past year if new source):

| | | | | | |
|---|---|---|---|---|---|
| Year | | | | | |
| Hours Operated | | | | | |

**FACILITY NAME:** Big Ox Energy - Siouxland **DATE:** May 2015

**NDEQ Facility ID#:** 105921 **Emission Point Identification#:** EP06

## Section 7.1: Combustion Flare (continued)

| Actual Pilot Information | | | | |
|---|---|---|---|---|
| 16) Indicate the quantity of each fuel type that has been combusted in the flare. | | | | |
| Fuel Type | Maximum Amount Combusted in the Previous Five Years | | Amount Last Year | |
| | Number | Units | Number | Units |
| | | | | |
| | | | | |

17) Provide the operating hours of this unit for the past five years (past year if new source):

| | | | | | |
|---|---|---|---|---|---|
| Year | | | | | |
| Hours Operated | | | | | |

**18) Actual Emission Calculations Attached?** ☐ **YES**

**19) Additional Information Attached?** ☐ **YES** ☐ **NO**

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# Attachment – Electronic Files

Permit Application

Modeling

Emission Calculations

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105921
AIR 043 0092

Nebraska DEQ

**Fact Sheet for Permit Number: CP15-008**
**Date:** April 15, 2016

**Facility Name:** Big Ox Energy – Siouxland, LLC **NDEQ Facility ID#:** 105921

**Mailing Address:**
6601 County Road R
Denmark, Wisconsin 54208

**Facility Location:**
1616 D Avenue
Dakota City, Dakota County, Nebraska

## DESCRIPTION OF THE FACILITY:

Big Ox Energy – Siouxland, LLC (Big Ox) is a new biologically-based natural gas production facility located in Dakota City, Nebraska. On May 18, 2015, the NDEQ received a finalized air quality construction permit application from Big Ox (#15-008) for a biogas facility capable of producing up to 1,314 million standard cubic feet (MMscf) of biogas per year from an anaerobic digestion process. Big Ox will process wastewater and organic wastes from the surrounding industries. Big Ox operates under Standard Industrial Classification (SIC) Code 2869 – Industrial Organic Chemicals, Not Elsewhere Classified and North American Industry Classification System (NAICS) Code 325199 – All Other Basic Organic Chemical Manufacturing.

On June 3, 2015, the NDEQ received an application for a variance to construct the proposed biologically-based natural gas production facility, which the NDEQ issued on July 14, 2015.

## TYPE AND QUANTITY OF AIR CONTAMINANT EMISSIONS ANTICIPATED:

The emission units that comprise the production facility are discussed in further detail below. The fact sheet attachment shows the potential emissions calculations with full references.

**Biogas System**
Big Ox will receive liquid wastewater through three forcemains into the facility that will collect in the Dissolved Air Flotation (DAF) Feed Tank. The DAF Feed Tank contents will be transferred to undergo treatment in a DAF process unit; the resulting solids from the DAF will be sent to the Equalization/Mixing Tank while the effluent wastewater will be sent to the sanitary sewer.

Big Ox will receive high strength wastes and packaged/canned food wastes by truck. The high strength wastes will be unloaded into two receiving pits which flow to the Receiving Tank, while the packaged/canned food wastes will be unloaded into a Turbo Separator. The Turbo Separator will separate the organic waste from the packaging material and the organic waste will be sent to the Receiving Tank while the packaging waste will be hauled out by truck. The Receiving Tank contents will be pumped to the Equalization/Mixing Tank.

From the Equalization/Mixing Tank, Big Ox will transfer the contents through a heat exchanger to Anaerobic Digester #1 (EU12) and then to Anaerobic Digester #2 (EU13). The contents from EU13 will be dewatered using two centrifuges; the centrate from the centrifuges will be sent to the DAF Feed Tank while the dewatered cake will be hauled out by truck. Big Ox will send the untreated biogas from EU12 and EU13 to the Biogas Cleanup Skid System (EU07). EU07 will scrub, compress, and directly inject the treated biogas into the adjacent natural gas transmission line. The scrubbing process will result in crystalline sulfur solids that will be washed and sold as a sulfur by-product. The compression process will result in a compressor tail gas that will be vented directly to the atmosphere.

If EU07 is unavailable or treated biogas cannot be injected into the natural gas transmission line, Big Ox will send the untreated biogas from EU12 and EU13 to an industrial flare (EU06) rated at 102.0 Million British thermal units per hour (MMBtu/hr). Big Ox has requested an operational limitation of 500 annual operating hours for EU06 to limit emissions from the combustion of untreated biogas.

EU06 will be capable of emitting particulate matter (PM), PM with an aerodynamic diameter of less than or equal to 10 microns ($PM_{10}$), PM with an aerodynamic diameter of less than or equal to 2.5 microns ($PM_{2.5}$), sulfur oxides ($SO_x$), nitrogen oxides ($NO_x$), carbon monoxide (CO), volatile organic compounds (VOCs), hazardous air pollutants (HAPs), and hydrogen sulfide ($H_2S$). EU07 will be capable of emitting $H_2S$.

**Emergency Engine**
Big Ox will have one 4-stroke lean burn (4SLB), 155 brake horsepower (hp) natural gas-fired spark ignition (SI) reciprocating internal combustion engine (RICE) to provide power to the facility in emergency situations (EU08). Because EU08 will operate as an emergency generator engine, Big Ox has requested an operational limitation of 500 annual operating hours. This unit will be capable of emitting PM, $PM_{10}$, $PM_{2.5}$, $SO_x$, $NO_x$, CO, VOCs, and HAPs.

**Combustion Equipment**
Big Ox will have five natural gas-fired boilers rated at 0.80 MMBtu/hr each (EU01 through EU05) used for generating process steam. In addition, the facility will have three natural gas-fired make-up air units to maintain adequate conditions within the processing area, two rated at 2.25 MMBtu/hr each (EU09 and EU10) and one rated at 1.505 MMBtu/hr (EU11). These units will be capable of emitting PM, $PM_{10}$, $PM_{2.5}$, $SO_x$, $NO_x$, CO, VOCs, and HAPs.

**Paved Haul Roads**
Big Ox provided estimated haul road distances of paved haul road travel within the facility for each type of haul road activity. The haul roads are a source of fugitive PM, $PM_{10}$, and $PM_{2.5}$ emissions.

**Emissions Summary**
The following table lists the potential emissions, including fugitive emissions, after permit issuance.

| Regulated Pollutant | Emissions (tons/year) |
|---|---|
| Particulate Matter (PM) | 2.27 |
| PM smaller than or equal to 10 microns ($PM_{10}$) | 1.12 |
| PM smaller than or equal to 2.5 microns ($PM_{2.5}$) | 0.85 |
| Sulfur Dioxide ($SO_2$) | 1.86 |
| Oxides of Nitrogen ($NO_x$) | 6.80 |
| Carbon Monoxide (CO) | 22.88 |
| Volatile Organic Compounds (VOC) | 0.49 |
| Hazardous Air Pollutants (HAPs) | 0.11 |
| Hydrogen Sulfide ($H_2S$) | 4.17 |
| Greenhouse Gases (GHG): | |
| Mass Basis | 24,609 |
| $CO_2e$ Basis | 35,983 |

## APPLICABLE REQUIREMENTS AND VARIANCES OR ALTERNATIVES TO REQUIRED STANDARDS:

Chapter 4 – Ambient Air Quality Standards:
Potential emissions from Big Ox, as limited by this permit, of all regulated air pollutants except for Total Reduced Sulfur (TRS) are less than the thresholds for which air dispersion modeling may be required as found in the NDEQ modeling guidance document entitled *Atmospheric Dispersion Modeling Guidance for Permits* (September 2005). Therefore, air dispersion modeling of TRS emissions was required as part of this permitting action. As described below, the modeling analysis predicts that Big Ox will remain in compliance with the ambient air quality standards for TRS.

*Air Quality Impact Analysis*
The air quality impact analysis for the proposed Big Ox facility consists of a screening model analysis to demonstrate that the proposed facility will not cause or contribute to any violations of Nebraska TRS Ambient Air Quality Standards (AAQS) listed in the table below. The screening analysis was completed for

only the 30-minute TRS AAQS. There are no models available that can predict impacts for 1-minute averaging periods.

| Nebraska AAQS Total Reduced Sulfur (TRS) | | |
|---|---|---|
| **Averaging Time** | **Concentration (ppm)** | **Form** |
| 1 minute | 10.0 | Maximum average concentration |
| 30-minutes | 0.10 | Maximum rolling average |

The specifics of the air quality impact analysis can be found in the facility's permitting file at the NDEQ. The modeling analysis used a screening model and was completed by HDR Engineering, Inc. and reviewed by the NDEQ. The U.S. EPA AERSCREEN version 14147, utilizing AERMOD version 14134, was the screening model used in this effort. The 30-minute maximum ambient air concentration is derived from the maximum 1-hour predicted concentration using the 1/5th Power Law. For the purpose of this modeling effort the Department looked at the maximum 30-minute modeled impact as demonstration of compliance with the maximum rolling average Nebraska TRS AAQS.

*TRS Results*

The TRS results for Nebraska TRS AAQS compliance are shown in the table below. The Digester Biogas Flare (EU06) and the Biogas Cleanup Skid System Tail Gas (EU07) were modeled separately, and their maximum impacts were added together.

| **Emission unit** | **AERSCREEN Maximum Modeled Prediction (ppm)** | **30-minute Nebraska AAQS (ppm)** |
|---|---|---|
| EU06: Digester Biogas Flare | .0007 | 0.1 |
| EU07: Biogas Cleanup Skid System Tail Gas | .09 | |
| Total | 0.0907 | |

*Air Quality Impact Summary*

The screening analysis demonstrates that impacts from the Digester Biogas Flare and the Biogas Cleanup Skid System Tail Gas emission units added together do not indicate a modeled violation of the Nebraska AAQS for TRS, and no further refined modeling is required.

The original AERSCREEN modeling analysis as performed by the consultant contained the two emission units capable of emitting $H_2S$. The analysis included the conservative assumption that both of the units would be operating simultaneously; however, the units cannot operate at the same time, as there would not be sufficient biogas production at the facility. In addition, the NDEQ calculated a facility-wide $H_2S$ emission rate less than the emission rate calculated by the consultant. For these reasons, the NDEQ is confident that the $H_2S$ emissions from the proposed Big Ox facility will comply with the Nebraska TRS AAQS, without conducting additional modeling at the lower emission rate.

To ensure that assumptions used in the modeling remain valid, the facility will have to meet stack height requirements for the various point sources and restrict public access to the facility (e.g., installing a fence in accordance with NDEQ guidelines or implementing other equivalent public access restrictions). If the results of any testing are significantly higher than the corresponding values used in the modeling, then the facility may need to remodel to show compliance with the Nebraska TRS AAQS.

Chapters 5 and 7 – Operating Permit Requirements:

After permit issuance, the potential emissions from Big Ox will not exceed one half of any of the Class I thresholds identified in Chapter 2, and Big Ox will therefore be considered a "no operating permit required-synthetic minor" (NPR-SM) source under the operating permit program. In accordance with Chapter 5, a NPR-SM facility has potential emissions above the Class I thresholds before permit issuance and actual

emissions below 50% of the Class I thresholds after permit issuance. Fugitive emissions were included when determining Class I applicability because Big Ox is a chemical process plant, which is one of the listed categories in Chapter 2, Section 002.

Chapter 17 – Construction Permit Requirements:
Big Ox is required to obtain a state construction permit because the potential emissions of $NO_x$ and CO prior to construction permit issuance exceed the thresholds identified in Chapter 17, Section 001.01.

The source-wide potential emissions including fugitives from Big Ox, after the issuance of this permit, fall into the following construction permit fee category:

Less than 50 tons per year of any listed air pollutant; or
Less than 2.5 tons per year of any single HAP; or
Less than 10 tons per year of any combination of HAPs

Therefore, Big Ox submitted a $250.00 fee to obtain this Air Quality Construction Permit, in accordance with Chapter 17, Section 003.01.

Chapter 18 – New Source Performance Standards (NSPS), and 40 CFR Part 60:
The emergency generator engine EU08 is subject to NSPS Subpart JJJJ. Because EU08 is subject to this NSPS, it is also subject to NSPS Subpart A. These subparts as well as potentially applicable subparts reviewed by the NDEQ are summarized below.

**The NDEQ has identified the following NSPS as applicable to Big Ox:**

*Subpart A – General Provisions:* This subpart, adopted by reference in Title 129, Chapter 18, Section 001.01, applies to those units subject to another NSPS subpart. EU08 is subject to Subpart JJJJ, and is therefore subject to the requirements of this subpart. Subpart JJJJ lists the sections of Subpart A that are applicable to EU08.

*Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines*: This subpart, adopted by reference in Title 129, Chapter 18, Section 001.82, applies to manufacturers, owners, and operators of SI internal combustion engines (ICE) as specified within this subpart. EU08 is subject to Subpart JJJJ because it is an SI ICE built after June 12, 2006. EU08 is required to comply with all requirements as specified within this subpart for emergency, 4SLB, stationary SI ICE greater than or equal to 130 hp. These requirements include emissions, operational, notification, reporting, and recordkeeping requirements for EU08. Big Ox will operate EU08 as an emergency stationary SI ICE under Subpart JJJJ. If Big Ox chooses not to operate EU08 as an emergency engine, the applicable requirements under this subpart may change.

**The NDEQ has identified the following NSPS as not applicable to Big Ox:**

*Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines*: This subpart, adopted by reference in Title 129, Chapter 18, Section 001.76, applies to manufacturers, owners, and operators of compression ignition (CI) ICE of specific sizes manufactured after specific dates as detailed within the subpart. EU08 is not subject to this subpart because it is not a CI ICE.

*Subpart OOOO – Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution*: This subpart, adopted by reference in Title 129, Chapter 18, Section 001.89, applies to owners and operators of onshore affected facilities that commence construction, modification, or reconstruction after August 23, 2011. This subpart does not apply to any emission units at Big Ox because the facility is not a natural gas production, transmission, or distribution site as defined in Subpart OOOO.

It is Big Ox's obligation to comply with all applicable NSPS subparts and requirements regardless of their inclusion in this permitting action or Title 129. These rules are subject to change. Additional and updated information on all NSPS is on the NDEQ NSPS Notebook, which can be located by visiting the NDEQ website at http://deq.ne.gov/, and first selecting the "Air" tab, then the "Air Grants, Planning and Outreach Program" dropdown menu tab, then the "New Source Performance Standards (NSPS) Program" dropdown

menu tab, and then select "New Source Performance Standards (NSPS) Program". Or alternately use the "Search NDEQ Web" search box on the upper right of the webpage and enter "New Source Performance Standards".

Chapter 19 – Prevention of Significant Deterioration (PSD):
Potential emissions from this proposed construction do not exceed the PSD thresholds. Big Ox falls into one of the 28 categories for which the 100 tons per year threshold applies as described in Chapter 2, Section 008, and must include fugitive emissions when determining PSD applicability. In addition, the NDEQ does not consider greenhouse gases as a regulated air pollutant in accordance with Chapter 1, Section 130. Because the PTE after permit issuance is less than the major source thresholds, Big Ox is a PSD minor source.

Chapter 20 – Particulate Matter Emissions:
*Section 002 – Particulate Emissions from Combustion Sources:* EU01 through EU06 and EU08 through EU11 are subject to the requirements of this section. As shown in the Fact Sheet Attachment, Big Ox will comply with this regulation by combusting only natural gas in EU01 through EU05 and EU08 through EU11, by combusting only untreated biogas and natural gas in EU06, and by properly operating and maintaining all emission units.

*Section 004 – Opacity:* No person may cause or allow emissions which are of an opacity equal to or greater than twenty percent (20%) as evaluated by an EPA-approved method, or recorded by a continuous opacity monitoring system. Big Ox will comply with this regulation by properly operating and maintaining equipment.

Chapter 27 – Hazardous Air Pollutants:
Big Ox is not subject to the requirements of this chapter because, as a new source, the facility-wide PTE of any single HAP is less than the 2.5 tons per year threshold and total HAPs are less than the 10 tons per year threshold listed in Section 002.

Chapter 28 – Hazardous Air Pollutant Emission Standards (NESHAPs):
Big Ox is an area source of HAPs because the PTE for any single HAP is below 10 tons per year and the PTE for total HAPs is below 25 tons per year. The NDEQ has identified that EU08 is subject to NESHAP Subparts A and ZZZZ. These subparts as well as potentially applicable subparts reviewed by the NDEQ are summarized below.

**The NDEQ has identified the following NESHAP as applicable to Big Ox:**

*Subpart A – General Provisions:* This subpart, adopted by reference in Title 129, Chapter 28, Section 001.01, applies to the owner or operator of any stationary source subject to a NESHAP unless otherwise stated in the rule. EU08 is subject to Subpart ZZZZ and is therefore subject to the requirements of this subpart. Subpart ZZZZ lists the sections of Subpart A that are applicable to EU08.

*Subpart ZZZZ – National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines:* This subpart, adopted by reference in Title 129, Chapter 28, Section 001.88, applies to existing, new, or reconstructed stationary RICE located at a major or area source of HAP emissions, excluding stationary RICE being tested at a stationary RICE test cell/stand. For the purpose of this subpart, EU08 is considered a new unit at an area source because construction has not yet commenced. New SI RICE to be located at area sources must comply with NSPS Subpart JJJJ to demonstrate compliance with NESHAP Subpart ZZZZ. If Big Ox chooses not to operate EU08 as an emergency engine, the applicable requirements under this subpart may change.

**The NDEQ has identified the following NESHAP as not applicable to Big Ox:**

*Subpart HH – National Emission Standards for Hazardous Air Pollutants From Oil and Natural Gas Production Facilities:* This subpart, adopted by reference in Title 129, Chapter 28, Section 001.30, applies to the owners and operators of affected sources located at oil and natural gas production facilities. Big Ox is an area source of HAPs and will not utilize triethylene glycol dehydration units; therefore, Big Ox is not subject to any requirements under this subpart.

*Subpart VVV – National Emission Standards for Hazardous Air Pollutants: Publicly Owned Treatment Works:* This subpart, adopted by reference in Title 129, Chapter 28, Section 001.50, applies to publicly owned treatment works (POTW) that are major sources of HAPs, or industrial POTW that are major or area sources of HAPs. Big Ox is not considered a POTW or industrial POTW as defined in this subpart; therefore, Big Ox is not subject to any requirements under this subpart.

*Subpart JJJJJJ – National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources:* This subpart, adopted by reference in Title 129, Chapter 28, Section 001.71, applies to each new and existing industrial, commercial, and institutional boiler located at an area source of HAPs. The boilers at Big Ox are not subject to this subpart because they are gas-fired boilers as defined in this subpart; therefore, Big Ox is not subject to any requirements under this subpart.

It is Big Ox's obligation to comply with all applicable NESHAP subparts and requirements regardless of their inclusion in this permitting action or Title 129. These rules are subject to change. Additional and updated information on all NESHAP is on the NDEQ Air Toxics Notebook, which can be located by visiting the NDEQ website at http://deq.ne.gov/, and first selecting the "Air" tab, then the "Air Grants, Planning and Outreach Program" dropdown menu tab, then the "Air Toxics Program" dropdown menu tab, and then select "Air Toxics Program". Or alternately use the "Search NDEQ Web" search box on the upper right of the webpage and enter "Air Toxics".

**Permit conditions specific to the proposed permit are discussed as follows:**

II.(A) When a source undertakes a program of construction, reconstruction, or modification they are required to notify the NDEQ when they begin construction/reconstruction/modification and when the source or modification becomes operational. These notifications help the NDEQ and source determine when an operating permit application (or revision to an existing operating permit) may be necessary and also whether some emission increases or decreases are within the contemporaneous period. This notification is either for initial operation of the source as a whole (if constructing a new source) or initial operation of the completed project (if modifying an existing source), not individual emission units. Individual emission units subject to specific NSPS or NESHAP standards may have additional notification requirements specific to those federal standards that are independent of this requirement. Startup of individual emission units (such as a boiler subject to an NSPS) does not necessarily mean the source or project has begun operations.

II.(B) This condition contains general recordkeeping and reporting requirements that apply to all permitted emission units, control equipment, and monitoring devices. Requirements include: a completion date when records must be completed, how long records need to be maintained, and the identification of specific types of records that must be maintained. Records are required to be maintained to ensure compliance with all applicable requirements, specifically those required in this permit. However, additional recordkeeping requirements may be established in the future to better ensure compliance. Documentation detailing operation and maintenance can be operational and maintenance manuals provided by the manufacturer. If manufacturer manuals are not available, the owner or operator must develop a document containing proper operation and maintenance requirements for each permitted emission unit and piece of required control equipment.

II.(C) This condition requires all permitted emission units, control equipment, and monitoring equipment to be properly installed, operated, and maintained. It is expected that the installation, operation, and maintenance conducted will be similar to the items contained in the documents detailing proper operation, inspection, and maintenance of the equipment (required in Specific Condition II.(B)(5)). It is very important that permitted and required equipment is operating properly and maintained since poorly maintained equipment may emit greater amounts of pollution into the atmosphere or monitor information incorrectly or inaccurately. Emission estimates for this permitting action are based on the requirement that all equipment is operating properly and being properly maintained.

II.(D) General performance testing requirements. When performance testing is required, it is intended to demonstrate and ensure the source will be in compliance on a continuous basis. As such, testing is

generally required to be conducted under conditions producing the highest emissions or loading to a control device. This typically is done at the maximum capacity, which at that level would not create an unsafe condition, and the facility will operate at that level at least some of the time. For a comprehensive evaluation on representative testing conditions, please review the NDEQ guidance on stack testing available on our web site or the national stack testing guidance document found on EPA's web site. All performance tests required throughout this permit are required to be conducted in accordance with these conditions. The owner or operator must provide a testing protocol and written (i.e. hard copy, not electronic or verbal) notice prior to testing to ensure the NDEQ has the opportunity to witness the testing and review the proposed testing plan. Operating parameters are monitored and recorded to document the conditions under which the testing was conducted. Subsequent monitoring of these parameters can indicate whether additional testing may be necessary because previous testing is not representative of current operations.

II.(E) This condition requires any emissions resulting from equipment failures, malfunctions, or other variations in control or process equipment performance that are, or may be, in excess of the applicable emission control regulations to be reported to the NDEQ in accordance with Title 129, Chapter 35, Section 005. The NDEQ must be notified when excess emissions have, or may have occurred along with the cause of the emissions in order to determine the appropriate enforcement action. These reports also assist with verifying proper operation and maintenance of process and control equipment.

II.(F) Modeling was conducted based on the information about stack parameters and ambient air boundaries as identified in the application. Should this information change from the values specified in this condition, the source should make notification to the NDEQ in accordance with General Condition I.(D).

III.(A) Specific Conditions for Anaerobic Digestion

This condition specifies the requirements for the biogas system – EU06, EU07, EU12, and EU13. EP06 is subject to the sections listed for Title 129, Chapter 20. At all times that the anaerobic digesters are producing biogas, the biogas must be either combusted in EU06 or treated in EU07. This will prevent untreated biogas from being vented directly to the atmosphere.

The digester biogas flare can only combust untreated biogas in the flare and natural gas in the pilot. Big Ox requested an operational limitation on the annual operating hours of the digester biogas flare in order to limit the combustion of untreated biogas. In addition, a lit pilot or flame must be present at all times that biogas is being routed to EU06 to ensure that untreated biogas is being combusted.

Big Ox must perform daily observations during the hours of operation of EU07 to ensure that there are no visible emissions, leaks, noise from the unit, or atypical monitoring parameters. By requiring daily observations, the NDEQ is confident that any malfunctions will be detected and corrected quickly.

III.(B) Specific Conditions for Emergency Generator Engine

This condition specifies the requirements for the emergency engine, EU08. The permitted emission point is subject to the sections listed for Title 129, Chapter 20. Big Ox requested an operational limitation on the annual operating hours of the emergency generator engine because the emission unit will only be used as an emergency engine. EU08 is subject to NSPS Subparts A and JJJJ and NESHAP Subparts A and ZZZZ and must comply with all applicable requirements.

III.(C) Specific Conditions for Paved Haul Roads

This condition specifies the requirements for the paved haul roads. The maximum silt loading used to evaluate haul road emissions is representative of a well-maintained paved road at sources that conduct best management practices (BMPs). Big Ox must use BMP to prevent fugitive dust from escaping the property and comply with Chapter 32. If necessary, the facility must implement

necessary corrective actions, which for paved roads might include road washing, vacuum sweeping, wheel washes, and debris removal.

**STATUTORY OR REGULATORY PROVISIONS ON WHICH PERMIT REQUIREMENTS ARE BASED:**

Applicable regulations: Title 129 - Nebraska Air Quality Regulations as amended July 6, 2015.

**PROCEDURES FOR FINAL DETERMINATION WITH RESPECT TO THE PROPOSED CONSTRUCTION PERMIT:**

The public notice, as required under Title 129 Chapter 14, shall be published on Thursday, March 10, 2016 in the South Sioux City Star newspaper and at http://deq.ne.gov/ under "Public Notices." Persons or groups shall have 30 days from that issuance of public notice (ending April 8, 2016) to provide the NDEQ with any written comments concerning the proposed permit action and/or to request a public hearing, in accordance with Title 129 Chapter 14. If a public hearing is granted by the Director, there will be a notice of that meeting published at least 30 days prior to the hearing.

During the 30-day public comment period, persons requiring further information about the proposed permit should contact:

Ana Williams
Construction Permitting Unit
NDEQ Air Quality Division
(402) 471-2189

Prior to the end of the 30-day public comment period, persons wanting to submit written comments or a written request for a public hearing may contact the Air Quality Division at:

ndeq.airquality@nebraska.gov

David Graiver, P.E.
Construction Permitting Unit Supervisor
NDEQ Air Quality Division
P.O. Box 98922
Lincoln, NE 68509-8922

If no public hearing is requested, the permit may be granted at the close of the 30-day comment period. If a public hearing is requested, the Director of the NDEQ may choose to extend the date on which the permit is to be granted until after that public hearing has been held.

**Telephone inquiries may be made at:**

(402) 471-2186

**TDD users should call (800) 833-7352 and ask the relay operator to call the Department at (402) 471-2186.**

Attachments:
Fact Sheet Attachment

# Fact Sheet Attachment

Potential Emissions Summary: EP01 through EP11, FS01

*Permit-Limited Capacities*

| | | |
|---|---|---|
| Digester Biogas Flare Hours Usage | 500 | hrs/yr |
| Emergency Generator Engine Hours Usage | 500 | hrs/yr |

*Emission Point Summary*

| Emission Point ID# | Emission Unit ID# and Process Description | Control Device ID# and Description |
|---|---|---|
| EP01 | EU01: 0.80 MMBtu/hr Natural Gas-Fired Process Boiler #1 | - |
| EP02 | EU02: 0.80 MMBtu/hr Natural Gas-Fired Process Boiler #2 | - |
| EP03 | EU03: 0.80 MMBtu/hr Natural Gas-Fired Process Boiler #3 | - |
| EP04 | EU04: 0.80 MMBtu/hr Natural Gas-Fired Process Boiler #4 | - |
| EP05 | EU05: 0.80 MMBtu/hr Natural Gas-Fired Process Boiler #5 | - |
| EP06 | EU06: 102.0 MMBtu/hr Digester Biogas Flare with 0.1 MMBtu/hr Natural Gas-Fired Pilot | - |
| EP07 | EU07: Biogas Cleanup Skid System | - |
| EP06 and/or EP07 | EU12: Anaerobic Digester #1 | EU06 and/or EU07 |
| | EU13: Anaerobic Digester #2 | |
| EP08 | EU08: 155 hp Emergency Generator Engine | - |
| EP09 | EU09: 2.25 MMBtu/hr Natural Gas-Fired Make-up Air Unit #1 | - |
| EP10 | EU10: 2.25 MMBtu/hr Natural Gas-Fired Make-up Air Unit #2 | - |
| EP11 | EU11: 1.505 MMBtu/hr Natural Gas-Fired Make-up Air Unit #3 | - |
| FS01 | FS01: Paved Haul Roads | - |

*Summary of PTE (ton/year)*

| Pollutant | EP06 | EP07 | EP08 | EP01 through EP05; EP09 through EP11 | FS01 | Total PTE |
|---|---|---|---|---|---|---|
| PM | 0.43 | - | 2.73E-05 | 8.16E-02 | 1.75 | 2.27 |
| $PM_{10}$ | 0.44 | - | 3.54E-03 | 0.33 | 0.35 | 1.12 |
| $PM_{2.5}$ | 0.44 | - | 3.54E-03 | 0.33 | 8.60E-02 | 0.85 |
| $SO_x$ | 1.83 | - | 2.08E-04 | 2.58E-02 | - | 1.86 |
| $NO_x$ | 1.06 | - | 1.45 | 4.30 | - | 6.80 |
| CO | 19.16 | - | 0.11 | 3.61 | - | 22.88 |
| VOC | 0.21 | - | 4.18E-02 | 0.24 | - | 0.49 |
| $H_2S$ | 1.98E-02 | 4.15 | - | - | - | 4.17 |
| GHGs (mass basis) | 2,979 | 16,463 | 41.43 | 5,126 | - | 24,609 |
| $CO_2e$ basis | 2,993 | 27,817 | 41.47 | 5,131 | - | 35,983 |
| Total HAPs | 8.11E-04 | - | 2.56E-02 | 8.11E-02 | - | 0.11 |

## Fact Sheet Attachment

Digester Biogas Flare - Biogas Combustion: EP06

*Assumptions*

- At Standard Conditions, Weight Concentration, $mg/m^3$ = ppm x $MW_{H2S}$/molar volume of gas
- Uncontrolled Emission Rate, lb/hr = Weight Concentration x (g/1000 mg) x (lb/453.6 g) x ($m^3$/35.313 $ft^3$) x gas flow (scf/min) x (60 min/hr)

| | | | |
|---|---|---|---|
| Volume Concentration, $H_2S$ (provided by source) | 300 | ppm | (Highest monitored value from Big Ox Energy - Denmark facility |
| Molecular Weight (MW), $H_2S$ | 34 | g/mole | plus a safety factor) |
| Molecular Weight (MW), Biogas | 24.96 | g/mole | |
| 1 Molar volume of gas (at standard condition) | 24.06 | liters | |

| Component | Percentage | Molecular Weight | |
|---|---|---|---|
| Methane | 68% | 16 g/mol | (Highest monitored value from |
| Carbon Dioxide | 32.0% | 44 g/mol | Big Ox Energy - Denmark facility) |
| $H_2S$ | 0.0300% | 34 g/mol | |
| $SO_2$ | -- | 64 g/mol | |

| | | | |
|---|---|---|---|
| Weight Concentration, $H_2S$ | 424 | $mg/m^3$ | |
| Biogas Flow Rate - Maximum Design Value | 2,500 | scf/min | (Maximum design value) |
| Biogas Flow Rate - Maximum Hourly | 0.15 | MMscf/hr | |
| Methane Flow Rate - Maximum Hourly | 0.10 | MMscf/hr | |
| Biogas Flow Rate - Annual Maximum | 1,314 | MMscf/yr | |
| Methane Flow Rate - Annual Maximum | 893.52 | MMscf/yr | |
| Uncontrolled Emission Rate, $H_2S$ | 3.97 | lb/hr | |
| Uncontrolled Emission Rate, $H_2S$ | 17.39 | ton/year | (Assumes full-time flare operation (8760 hrs/yr)) |
| Estimated Flare Control Efficiency<br>Conversion of $H_2S$ to $SO_2$ | 98% | | |
| Controlled Emission Rate, $H_2S$ | 0.08 | lb/hr | |
| Controlled Emission Rate, $H_2S$ | 0.35 | ton/year | (Assumes full-time flare operation (8760 hrs/yr)) |
| Heat Content of Methane | 1,000 | Btu/scf | |
| Heat Content of Biogas | 680 | Btu/scf | |
| Operating Time | 500 | hours/year | (Limit to flare operation) |
| Calculated Biogas Heat Input of Flare - Max Hourly<br>[Gas Flow Rate (MMscf/hr) x Heat Content of Biogas (Btu/scf)] | 102.00 | MMBtu/hr | |
| Calculated Biogas Heat Input of Flare - Annual Max<br>[Gas Flow Rate (MMscf/yr) x Heat Content of Biogas (Btu/scf)] | 893,520 | MMBtu/yr | |
| Calculated Methane Heat Input of Flare - Max Hourly<br>[Methane Flow Rate (MMscf/hr) x Heat Content of Methane (Btu/scf)] | 102.00 | MMBtu/hr | |
| Calculated Methane Heat Input of Flare - Annual Max<br>[Methane Flow Rate (MMscf/yr) x Heat Content of Methane (Btu/scf)] | 893,520 | MMBtu/yr | |

| Pollutant | Emission Factors[1] | | Potential Emission Rate (lbs/hr) | Potential Emission Rate (tons/year) | Limited Operation Potential Emission Rate (tons/yr) |
|---|---|---|---|---|---|
| PM | 17 | lb/MMdscf Methane | 1.73 | 7.59 | 0.43 |
| $PM_{10}$ | 17 | lb/MMdscf Methane | 1.73 | 7.59 | 0.43 |
| $PM_{2.5}$ | 17 | lb/MMdscf Methane | 1.73 | 7.59 | 0.43 |
| $SO_2$ | 7.32 | lb/hr[2] | 7.32 | 32.08 | 1.83 |
| $NO_x$ | 40 | lb/MMdscf Methane | 4.08 | 17.87 | 1.02 |
| CO | 750 | lb/MMdscf Methane | 76.50 | 335.07 | 19.13 |
| VOC | 5.5 | lb/MMscf | 0.83 | 3.61 | 0.21 |
| $H_2S$ | 0.08 | lb/hr[3] | 0.08 | 0.35 | 1.98E-02 |
| Greenhouse Gases[4],[5] | | | | | |
| $CO_2$ | 114.79 | lb/MMBtu Biogas | 11,709 | 51,284 | 2,927 |
| $CH_4$ | 7.10E-03 | lb/MMBtu Biogas | 0.72 | 3.17 | 0.18 |
| $N_2O$ | 1.40E-03 | lb/MMBtu Biogas | 0.14 | 0.63 | 3.57E-02 |
| GHGs (mass basis) | | | 11,709 | 51,287 | 2,927 |
| $CO_2e$ basis | | | 11,768 | 51,544 | 2,942 |

[1]Emission Factors for PM, $PM_{10}$, and $PM_{2.5}$, $NO_x$, and CO taken from AP-42 Table 2.4-4 (11/1998) and VOC from AP-42 Table 1.4-2 (7/1998), $SO_2$ and $H_2S$ established from information/calculation above.

[2]$SO_2$ Emission Factor (lb/hr) = Uncontrolled Emission Rate, $H_2S$ (lb/hr) x Estimated Control Efficiency (%) x ($MW_{SO2}/MW_{H2S}$)

[3]$H_2S$ Emission Factor (lb/hr) = Uncontrolled Emission Rate, $H_2S$ (lb/hr) x [100% - Estimated Control Efficiency (%)]

[4]Emission Factors for $CO_2$, $CH_4$ and $N_2O$, from 40 CFR 98 Tables C-1 (11/29/2013) and C-2 (11/29/2013)

[5]The Global Warming Potentials (GWP) are from 40 CFR Part 98 Table A-1 to Subpart A as published October 30, 2009.

## Fact Sheet Attachment

Digester Biogas Flare - Pilot Natural Gas Combustion: EP06

| | | |
|---|---|---|
| Total Heat Input Capacity of Pilot | 0.1 | MMBtu/hr |
| Heating Value | 1,020 | Btu/scf |
| Operating Time | 8,760 | hr/yr |
| Total Natural Gas Usage | 9.80E-05 | MMscf/hr |

| Pollutant | Emission Factor[1] (lb/MMscf) | Potential Emission Rate (lbs/hr) | Potential Emission Rate (tons/year) |
|---|---|---|---|
| PM | 1.9 | 1.86E-04 | 8.16E-04 |
| $PM_{10}$ | 7.6 | 7.45E-04 | 3.26E-03 |
| $PM_{2.5}$ | 7.6 | 7.45E-04 | 3.26E-03 |
| $SO_2$ | 0.6 | 5.88E-05 | 2.58E-04 |
| $NO_x$ | 100 | 9.80E-03 | 4.29E-02 |
| CO | 84 | 8.24E-03 | 3.61E-02 |
| VOC | 5.5 | 5.39E-04 | 2.36E-03 |
| Greenhouse Gases[2][3] | | | |
| $CO_2$ | 119,317 | 11.70 | 51.24 |
| $CH_4$ | 2.25 | 2.20E-04 | 9.66E-04 |
| $N_2O$ | 0.22 | 2.20E-05 | 9.66E-05 |
| GHGs (mass basis) | | 11.70 | 51.24 |
| $CO_2e$ basis | | 11.71 | 51.29 |
| Hazardous Air Pollutants | | | |
| Benzene | 2.10E-03 | 2.06E-07 | 9.02E-07 |
| Dichlorobenzene | 1.20E-03 | 1.18E-07 | 5.15E-07 |
| Formaldehyde | 7.50E-02 | 7.35E-06 | 3.22E-05 |
| Hexane | 1.80 | 1.76E-04 | 7.73E-04 |
| Lead Compounds | 5.00E-04 | 4.90E-08 | 2.15E-07 |
| Naphthalene | 6.10E-04 | 5.98E-08 | 2.62E-07 |
| Polycyclic Organic Matter | 8.82E-05 | 8.65E-09 | 3.79E-08 |
| Toluene | 3.40E-03 | 3.33E-07 | 1.46E-06 |
| Arsenic Compounds | 2.00E-04 | 1.96E-08 | 8.59E-08 |
| Beryllium Compounds | 1.20E-05 | 1.18E-09 | 5.15E-09 |
| Cadmium Compounds | 1.10E-03 | 1.08E-07 | 4.72E-07 |
| Chromium Compounds | 1.40E-03 | 1.37E-07 | 6.01E-07 |
| Cobalt Compounds | 8.40E-05 | 8.24E-09 | 3.61E-08 |
| Manganese Compounds | 3.80E-04 | 3.73E-08 | 1.63E-07 |
| Mercury Compounds | 2.60E-04 | 2.55E-08 | 1.12E-07 |
| Nickel Compounds | 2.10E-03 | 2.06E-07 | 9.02E-07 |
| Selenium Compounds | 2.40E-05 | 2.35E-09 | 1.03E-08 |
| Total HAPs | | 1.85E-04 | 8.11E-04 |

[1]Emission Factors from AP-42 Tables 1.4-1. 1.4-2, 1.4-3 and 1.4-4 (7/1998)

[2]Emission Factors for $CO_2$, $CH_4$ and $N_2O$, from 40 CFR 98 Tables C-1 (11/29/2013) and C-2 (11/29/2013). Converted to lb/MMscf.

[3]The Global Warming Potentials (GWP) are from 40 CFR Part 98 Table A-1 to Subpart A as published October 30, 2009.

## Fact Sheet Attachment

Digester Biogas Flare - Total Emissions: EP06

| Pollutant | Potential Emission Rate: Biogas Combustion (lb/hr) | Potential Emission Rate: Pilot Natural Gas Combustion (lb/hr) | Total Potential Emission Rate (lb/hr) | Total Potential Emission Rate (tons/year) | Limited Operation Potential Emission Rate (tons/yr) |
|---|---|---|---|---|---|
| PM | 1.73 | 1.86E-04 | 1.73 | 7.60 | 0.43 |
| $PM_{10}$ | 1.73 | 7.45E-04 | 1.73 | 7.60 | 0.44 |
| $PM_{2.5}$ | 1.73 | 7.45E-04 | 1.73 | 7.60 | 0.44 |
| $SO_2$ | 7.32 | 5.88E-05 | 7.32 | 32.08 | 1.83 |
| $NO_x$ | 4.08 | 9.80E-03 | 4.09 | 17.91 | 1.06 |
| CO | 76.50 | 8.24E-03 | 76.51 | 335.11 | 19.16 |
| VOC | 0.83 | 5.39E-04 | 0.83 | 3.62 | 0.21 |
| $H_2S$ | 0.08 | - | 0.08 | 0.35 | 1.98E-02 |
| Greenhouse Gases | | | | | |
| $CO_2$ | 11,709 | 11.70 | 11,720 | 51,335 | 2,978 |
| $CH_4$ | 0.72 | 2.20E-04 | 0.72 | 3.17 | 0.18 |
| $N_2O$ | 0.14 | 2.20E-05 | 0.14 | 0.63 | 3.58E-02 |
| GHGs (mass basis) | 11,709 | 11.70 | 11,721 | 51,339 | 2,979 |
| $CO_2e$ basis | 11,768 | 11.71 | 11,780 | 51,595 | 2,993 |
| Total HAPs | - | 1.85E-04 | 1.85E-04 | 8.11E-04 | 8.11E-04 |

## Fact Sheet Attachment

Biogas Cleanup Skid System: EP07

*Assumptions*

- At Standard Conditions, Weight Concentration, $mg/m^3$ = ppm x $MW_{H2S}$/molar volume of gas
- Uncontrolled Emission Rate, lb/hr = Weight Concentration x (g/1000 mg) x (lb/453.6 g) x ($m^3$/35.313 $ft^3$) x gas flow (scf/min) x (60 min/hr)

| | | | |
|---|---|---|---|
| Volume Concentration, $H_2S$ (provided by source) | 300 | ppm | |
| Molecular Weight (MW), $H_2S$ | 34 | g/mole | |
| Molecular Weight (MW), Tail Gas | 40.52 | g/mole | (Molecular weight based on gas concentration below) |
| 1 Molar volume of gas (at standard condition) | 24.06 | liters | |

| Component | Percentage | Molecular Weight |
|---|---|---|
| Methane | 8.73% | 16 g/mol (Percentage from vendor cut sheets for gas cleanup skid) |
| Carbon Dioxide | 88.9% | 44 g/mol |
| $H_2S$ | 0.0300% | 34 g/mol |
| $SO_2$ | -- | 64 g/mol |

| | | |
|---|---|---|
| Weight Concentration, $H_2S$ | 424 | $mg/m^3$ |
| Weight Concentration, Methane | 58,055 | $mg/m^3$ |
| Weight Concentration, Carbon Dioxide | 1,625,586 | $mg/m^3$ |
| Gas Flow Rate - Maximum Hourly | 596 | scf/min |
| Gas Flow Rate - Maximum Hourly | 3.58E-02 | MMscf/hr |
| Methane Flow Rate - Maximum Hourly | 3.12E-03 | MMscf/hr |
| Gas Flow Rate - Annual Maximum | 313.26 | MMscf/yr |
| Methane Flow Rate - Annual Maximum | 27.35 | MMscf/yr |
| Uncontrolled Emission Rate, $H_2S$ | 0.95 | lb/hr |
| Uncontrolled Emission Rate, $H_2S$<br>Based on 8,760 operating hours | 4.15 | ton/year |
| Uncontrolled Emission Rate, Methane | 129.61 | lb/hr |
| Uncontrolled Emission Rate, Methane<br>Based on 8,760 operating hours | 567.68 | ton/year |
| Uncontrolled Emission Rate, Carbon Dioxide | 3,629 | lb/hr |
| Uncontrolled Emission Rate, Carbon Dioxide<br>Based on 8,760 operating hours | 15,895 | ton/year |
| Estimated Flare Control Efficiency<br>Conversion of $H_2S$ to $SO_2$ | 0% | |
| Operating Time | 8,760 | hours/year |

| Pollutant | Emission Factors (lbs/hr) | Potential Emission Rate (lbs/hr) | Potential Emission Rate (tons/year) |
|---|---|---|---|
| $H_2S$ | 0.95 | 0.95 | 4.15 |
| Greenhouse Gases[2],[3] | | | |
| $CO_2$ | 3,629 | 3,629 | 15,895 |
| $CH_4$ | 129.61 | 129.61 | 567.68 |
| GHGs (mass basis) | | 3,759 | 16,463 |
| $CO_2e$ basis | | 6,351 | 27,817 |

[1] $H_2S$ Emission Factor (lb/hr) = Uncontrolled Emission Rate, $H_2S$ (lb/hr) x Estimated Control Efficiency (%).

[2] Emission Factors for $CO_2$ and $CH_4$, from Uncontrolled Emission Rate (lb/hr) x Estimated Control Efficiency (%).

[3] The Global Warming Potentials (GWP) are from 40 CFR Part 98 Table A-1 to Subpart A as published October 30, 2009.

## Fact Sheet Attachment

Natural Gas-Fired Engine: EP08

| | |
|---|---|
| Engine Output (hp) | 155 |
| Engine Heat Input (MMBtu/hr)[1] | 1.42 |
| Maximum Hours of Operation (hrs/yr) | 500 |

| Pollutant | Emission Factor[2] (lb/MMBtu) | Emission Rate (lbs/hr) | Emission Rate (ton/year) |
|---|---|---|---|
| PM | 7.71E-05 | 1.09E-04 | 2.73E-05 |
| $PM_{10}$ | 9.99E-03 | 1.41E-02 | 3.54E-03 |
| $PM_{2.5}$ | 9.99E-03 | 1.41E-02 | 3.54E-03 |
| $SO_x$ | 5.88E-04 | 8.33E-04 | 2.08E-04 |
| $NO_x$ | 4.08 | 5.78 | 1.45 |
| CO | 0.32 | 0.45 | 0.11 |
| VOC | 0.12 | 0.17 | 4.18E-02 |
| Greenhouse Gases | | | |
| $CO_2$ [3] | 116.98 | 165.73 | 41.43 |
| $CH_4$ [4] | 2.20E-03 | 3.12E-03 | 7.81E-04 |
| $N_2O$ [4] | 2.20E-04 | 3.12E-04 | 7.81E-05 |
| GHGs (mass basis) | | 165.73 | 41.43 |
| $CO_2e$ basis[5] | | 165.89 | 41.47 |
| Hazardous Air Pollutants | | | |
| Acetaldehyde | 8.36E-03 | 1.18E-02 | 2.96E-03 |
| Acrolein | 5.14E-03 | 7.28E-03 | 1.82E-03 |
| Benzene | 4.40E-04 | 6.23E-04 | 1.56E-04 |
| Formaldehyde | 5.28E-02 | 7.48E-02 | 1.87E-02 |
| Methanol | 2.50E-03 | 3.54E-03 | 8.85E-04 |
| n-Hexane | 1.11E-03 | 1.57E-03 | 3.93E-04 |
| Toluene | 4.08E-04 | 5.78E-04 | 1.45E-04 |
| Other HAPs | 1.51E-03 | 2.14E-03 | 5.36E-04 |
| Total HAPs | 7.23E-02 | 0.10 | 2.56E-02 |

[1] Calculated using a maximum fuel consumption of 1,389 cfh supplied in the application.

[2] Emission factors from AP-42, Chapter 3.2 (8/2000), Table 3.2-2.

[3] Emission factor from 40 CFR 98 Table C-1 (11/29/2013). Converted to lb/MMBtu.

[4] Emission factor from 40 CFR 98 Table C-2 (11/29/2013). Converted to lb/MMBtu.

[5] 40 CFR 98 Table A-1 as published October 30, 2009.

## Fact Sheet Attachment

Natural Gas-Fired Boilers and Make-up Air Units: EP01 through EP05; EP09 through EP11

| | |
|---|---|
| Heat Input Capacity Combined Units (MMBtu/hr) | 10.01 |
| Heating Value of Natural Gas (Btu/scf)[1] | 1,020 |
| Natural Gas Throughput (MMscf/hr) | 9.81E-03 |
| Maximum Hours of Operation (hrs/yr) | 8,760 |

| Pollutant | Emission Factor[2] (lb/MMscf) | Emission Rate (lbs/hr) | Emission Rate (ton/year) |
|---|---|---|---|
| PM | 1.90 | 1.86E-02 | 8.16E-02 |
| $PM_{10}$ | 7.60 | 7.45E-02 | 0.33 |
| $PM_{2.5}$ | 7.60 | 7.45E-02 | 0.33 |
| $SO_x$ | 0.60 | 5.89E-03 | 2.58E-02 |
| $NO_x$ | 100.00 | 0.98 | 4.30 |
| CO | 84.00 | 0.82 | 3.61 |
| VOC | 5.50 | 5.39E-02 | 0.24 |
| Greenhouse Gases | | | |
| $CO_2$[3] | 119,317 | 1,170 | 5,126 |
| $CH_4$[4] | 2.25 | 2.21E-02 | 9.66E-02 |
| $N_2O$[4] | 0.22 | 2.21E-03 | 9.66E-03 |
| GHGs (mass basis) | | 1,170 | 5,126 |
| $CO_2e$ basis[5] | | 1,172 | 5,131 |
| Hazardous Air Pollutants | | | |
| Formaldehyde | 7.50E-02 | 7.36E-04 | 3.22E-03 |
| Hexane | 1.80 | 1.77E-02 | 7.73E-02 |
| Other HAPs | 1.35E-02 | 1.32E-04 | 5.78E-04 |
| Total HAPs | | 1.85E-02 | 8.11E-02 |

[1] AP-42 Section 1.4.1 (7/1998).

[2] Emission factors from AP-42, Chapter 1.4 (7/1998), Tables 1.4-1, 1.4-2, 1.4-3, and 1.4-4.

[3] Emission factor from 40 CFR 98 Table C-1 (11/29/2013). Converted to lb/MMscf.

[4] Emission factor from 40 CFR 98 Table C-2 (11/29/2013). Converted to lb/MMscf.

[5] 40 CFR 98 Table A-1 as published October 30, 2009.

## Fact Sheet Attachment

Paved Haul Roads: FS01

Paved roads {AP-42 Chapter 13.2.1 (1/11)}

*Equation (2): (modified)*

$$E = k \times (sL)^{0.91} \times (W)^{1.02} \times \left(1 - \frac{P}{4 \times 365}\right)$$

| | $k$ |
|---|---|
| PM | 0.011 |
| $PM_{10}$ | 0.0022 |
| $PM_{2.5}$ | 0.00054 |

Unpaved roads {AP-42 Chapter 13.2.2 (11/06)}

*Equation (1a): (modified)*

$$E = k \times \left(\frac{sC}{12}\right)^{a} \times \left(\frac{W}{3}\right)^{b} \times \left(\frac{365 - P}{365}\right) \times \left(\frac{S}{30}\right)^{d} \times (1 - CE)$$

| | $k$ | $a$ | $b$ | $d$ |
|---|---|---|---|---|
| PM | 4.9 | 0.7 | 0.45 | 0.3 |
| $PM_{10}$ | 1.5 | 0.9 | 0.45 | 0.5 |
| $PM_{2.5}$ | 0.15 | 0.9 | 0.45 | 0.5 |

*Haul Road / Traffic Parameters*

| Activity / Road Description | Road Type / Silt Value | | Roundtrip Length (feet) | | Truck Weight (tons) | | | Ave. Speed (mph) | Unrestricted Maximum Throughput (units/yr) | Ave. Truck Capacity (units/truck) | | Annual VMT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | empty | full | empty | full | Ave. | | | | | |
| High Strength Waste | p | 3.00 | 943 | 943 | 12.5 | 40 | 26.3 | 30 | 60,225 | 28 | ton | 782 |
| Dewatered Cake | p | 3.00 | 1,604 | 1,604 | 12.5 | 40 | 26.3 | 30 | 60,225 | 28 | ton | 1,331 |
| Packaged Waste | p | 3.00 | 943 | 943 | 12.5 | 40 | 26.3 | 30 | 60,225 | 28 | ton | 782 |
| Waste Packaging | p | 3.00 | 943 | 943 | 12.5 | 40 | 26.3 | 30 | 60,225 | 28 | ton | 782 |
| Sulfur Solids from Biogas Cleanup | p | 3.00 | 943 | 943 | 12.5 | 40 | 26.3 | 30 | 60,225 | 28 | ton | 782 |

*Emission Calculations*

| Activity / Road Description | Emission Factors (lb/VMT) | | | Potential Emissions (tons/yr) | | |
|---|---|---|---|---|---|---|
| | PM | $PM_{10}$ | $PM_{2.5}$ | PM | $PM_{10}$ | $PM_{2.5}$ |
| High Strength Waste | 0.79 | 0.16 | 0.04 | 0.31 | 0.06 | 0.02 |
| Dewatered Cake | 0.79 | 0.16 | 0.04 | 0.52 | 0.10 | 0.03 |
| Packaged Waste | 0.79 | 0.16 | 0.04 | 0.31 | 0.06 | 0.02 |
| Waste Packaging | 0.79 | 0.16 | 0.04 | 0.31 | 0.06 | 0.02 |
| Sulfur Solids from Biogas Cleanup | 0.79 | 0.16 | 0.04 | 0.31 | 0.06 | 0.02 |
| Total Annual Emissions: | | | | 1.75 | 0.35 | 0.09 |

**Description of Constants/Variables**

$E$: haul road emissions (lb/VMT)

$k$, $d$: dimensionless constants from AP-42 Chapter 13.2.1 (1/11) (paved)

$k$, $a$, $b$, $c$, $d$: dimensionless constants from AP-42 Tables 13.2.1-1 (1/11) & 13.2.2-2 (11/06) (unpaved)

$sL$: silt loading ($g/m^2$) of paved road surface

$sC$: silt content (%) of unpaved road surface

$W$: average vehicle weight (tons)

$P$: days/yr with at least 0.01" of precipitation

$P$ = 90 default = 90

$S$: mean vehicle speed on road (mph) default = 30, minimum =15

$CE$: unpaved road, dust control efficiency

$CE$ = 0 % default = 0%

VMT: vehicle miles traveled

## Fact Sheet Attachment

Chapter 20 PM Emissions Limitations: EP01 through EP06; EP08 through EP11

*Title 129, Chapter 20, Section 002, Table 20-1*

| Total Heat Input (MMBtu/hr) | Maximum Allowable Emissions of PM (lbs/MMBtu) |
|---|---|
| 10 or less | 0.6 |
| Between 10 and 10,000 | $1.026/I^{0.233}$ |
| | Where I = total heat input in MMBtu/hr. |
| 10,000 or more | 0.12 |

| Emission Point | Maximum MMBtu/hr | Allowable PM (lbs/MMBtu) | Unit PM emission rate (lbs/MMBtu) |
|---|---|---|---|
| EP01 | 0.80 | 0.60 | 1.86E-03 |
| EP02 | 0.80 | 0.60 | 1.86E-03 |
| EP03 | 0.80 | 0.60 | 1.86E-03 |
| EP04 | 0.80 | 0.60 | 1.86E-03 |
| EP05 | 0.80 | 0.60 | 1.86E-03 |
| EP06 | 102.00 | 0.35 | 1.70E-02 |
| EP08 | 1.42 | 0.60 | 7.71E-05 |
| EP09 | 2.25 | 0.60 | 1.86E-03 |
| EP10 | 2.25 | 0.60 | 1.86E-03 |
| EP11 | 1.51 | 0.60 | 1.86E-03 |